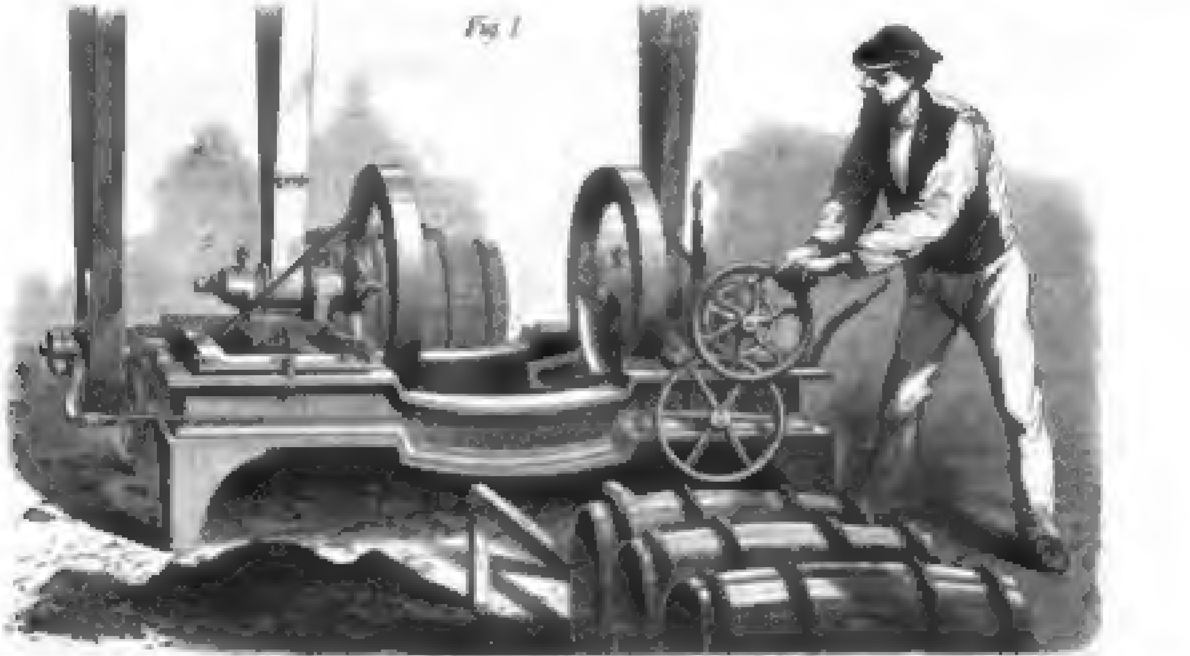
SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXX.—No. 13. [NEW SERIES.] | NEW YORK, MARCH 28, 1874. | [$3 per Annum IN ADVANCE.]



HOLMES' BARREL MAKING MACHINERY.—THE CHAMFERING AND CROZING MACHINE.

HOLMES' IMPROVED BARREL MAKING MACHINERY.

Our readers, and especially those interested in the manufacture of barrels, or who use the article to any great extent in their various callings, are doubtless aware that, not long since, strikes of considerable magnitude occurred among the coopers of this State. These movements owed their origin, among other causes, to the introduction into the market and use, by barrel manufacturers, of improved machinery by means of which the labor of skilled mechanics was, in a large measure, dispensed with, and the work readily accomplished by ordinary day laborers. The point maintained by the coopers was, first, direct opposition to the machines as a substitute for hand labor; but this position they afterwards abandoned, and fell back on the demand that they, and not men out of the trade, should be employed to run the shops. The question in some localities is still at issue; but in others, and especially in the manufactory which we recently had occasion to visit, the employers have prevailed, and are consequently carrying on their business with both a decrease in expenses and an increase in the quantity of their products. We allude to these uprisings, in the present connection, not to discuss their merits or demerits, but as a point of interest in reference to the machines represented in our engravings, which are the principal devices which have already caused in a certain degree, and we do not doubt are in the future destined to effect, an important revolution in the coopers' trade.

We recently devoted a few hours to the inspection of the barrel factory attached to the extensive sugar refining works of Messrs. Havemeyer & Elder, in Brooklyn, our object being to examine the operation of barrel making as performed by the machinery we are about to describe. With the superintendent of the establishment as a guide, we were conducted through various rooms heaped to the beams with thousands of bundles of staves and hoops, across courtyards, and, finally, into the long apartment which formed the principal shop. We cannot describe the noise which saluted us on [illegible], for the word fails to express it; it was equal to that of a regiment of boiler rivetors, and worse than a few dozen stamp hammers, so that remarks of an explanatory nature were out of the question, or else were imparted by the aid of pantomime. Picking our way between belts, and dodging the barrels which were constantly flying about the room, we reached a [illegible] workmen were busily at work setting up the barrels before delivering them to the machinery. The setting up form is composed of two heavy circles of iron, secured together and bolted to the floor, from these rise short standards which support a hoop. The staves are set in between the iron circles, and fitted carefully together. The iron truss hoops, which are previously placed in proper position, are lifted up by hand so as to embrace the lower portions of the staves and hold them in place, when the whole is lifted out of the frame. One half the barrel is now tightly held together, but the remainder was still open and flaring. To secure this in similar manner, a rope was passed around the flaring ends and taken to a hand windlass, a few turns of which brought the staves together, when the truss hoops were slipped over the extremities, and the barrel was ready to be heated in order to cause the staves to assume the curved shape. The heaters were simple iron cylindrical stoves [illegible] with a short iron cover, which was let down from above. Here the wood was well warmed through.

The leveling machine, to which the cask first passes, is a simple contrivance, the construction of which will be readily followed from our illustration (Fig. 2, on page 194), little explanation being necessary. Its object is to bring the cask into a shape that, when on end, it will stand in a perpendicular position and not lean in any direction. The barrel is placed between the two disks shown, where it is held by the projections on the inner faces of the latter. As we looked on, a workman moved the handle, a clutch was thrown into action, and the right hand disk quickly advanced, powerfully compressing the cask. There was no blow or jar; and in less time than we have taken to pen the words, the barrel was out of the machine, perfectly leveled and true. From three to four hundred casks per hour, we were told, could be thus manipulated.

BARREL MAKING.—Fig. 3.—THE TRUSSING MACHINE.

Following our barrel, as it went rolling across the room, we next found it placed on end, and in the clutches of a number of hooked bars which protruded up through the floor, as represented in Fig. 3. The longer arms just caught above the upper truss hoops, and sliding collars on them similarly caught on the second bands. The lower hoops were pressed against notched standards, which also stood up from the floor, but did not pass through the same. The long arms, as we came to the machine, were spreading themselves outwards and apart, and at this moment the barrel was inserted. Then, as they came together, they caught the hoops in the manner above stated, and pulled down, forcing the heavy iron rings over the more bulging portion of the cask, and of course wedging them on the more tightly. The same effect was produced by the stationary short lower standards, by their resistance to the lower hoops moving on the barrel was forced down. The simple mechanism which actuates this device, we found located in the cellar. It is a screw suitably connected with reversible gearing, the latter being governed by the lever handle shown in the engraving.

The machine, we noted, was operated by a single man and with great ease. A very strong power was brought to bear on each hoop, which thoroughly trussed the barrel with remarkable rapidity. We were informed that, although we saw it operating on slack work, which, such as sugar barrels, are termed, it was equally efficacious in [illegible]

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year	$3 00
One copy, six months	1 50
CLUB RATES { Ten copies, one year, each $2 50	25 00
CLUB RATES { Over ten copies, same rate, each	2 50

VOLUME XXX, No. 13. [New Series.] Twenty-ninth Year.

NEW YORK, SATURDAY, MARCH 28, 1874.

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THE POST OFFICE AND THE TELEGRAPH.

Shall we have a postal telegraph? Excepting the financial policy of the nation, this is perhaps the most important question just now before the country. Certainly there is none involving results more far-reaching or significant.

As the matter stands, the parties to the discussion are, roughly speaking, these four:

1. The Postmaster General, and those interested with him in extending the scope and authority of the postal department, either for personal and political ends, or from a sincere desire to cheapen the telegraph and extend its facilities to all parts of the country.

2. Certain capitalists, who wish to monopolize the telegraphic business of the country, and who offer low tariffs in return for the privileges of monopoly, free offices, freedom from taxation and other substantial benefits.

3. The telegraph companies, which are naturally opposed to any measures likely to lessen the value of the properties they have acquired, or take from them the business they have built up.

4. The users of the telegraph, who so naturally desire the quickest, cheapest, and trustiest means of communication attainable, caring little whether it is the result of public or private enterprise, so long as the system is self-supporting and reasonably free from financial or political risks.

The arguments of those who would have the general government take possession of the telegraphs are somewhat diffusely presented by the Postmaster General. Critically examined, they appear to be neither very numerous nor very cogent. Chief among them is the assertion that the government could and would largely reduce the cost of messages, and at the same time extend the lines to parts of the country not likely to be reached so long as the telegraphs remain under private management. As Mr. Creswell puts it, the telegraph now follows the march of civilization, but does not lead it. Why it should not do so he neglects to say, assuming, as not to be questioned, the theory that the telegraph is an educator which the government should give the people whether they are conscious of needing it or not, trusting to their future enlightenment to make business enough to render the system profitable. As an aid to this beneficent work, a low and uniform tariff would of course be exceedingly potent.

In addition to their neglect to do missionary work by extending their lines faster and farther than there is a paying demand for telegraphic facilities, the telegraph companies consult their own interest in preference to that of the public at large in fixing their charges for service. These the Postmaster General characterizes as exorbitant, and aggravated in many cases by enormous charges for the delivery, the lack of restraint upon the companies in this matter being "perhaps the greatest evil of the American system." And even if the rates are reduced from time to time with the increase of business, the good effected, we are told, will be more than counterbalanced by evils inevitably attendant upon private management, such as the possible abuse of the wires for personal ends by the men controlling the business, the discrimination made between the messages of different customers both as to cost and order of transmission, the onerous and dangerous extent of the free message business, and the vast and irresponsible influence of the telegraph managers upon the press of the country. For these and other evils, actual or possible, he sees but one preventive and cure, and that is the purchase of the telegraphic lines by the government under the provisions of the act of 1866, or else the creation of a new system commensurate with the present and prospective needs of the country.

In support of this position, Mr. Creswell presents an imposing array of telegraphic estimates and statistics, domestic and foreign; but lacking a practical acquaintance with the workings of a telegraphic system, his deductions and assertions are for the most part singularly at variance with the legitimate inferences to be drawn from the facts he presents. His tables furnish a perfect arsenal of weapons for his opponents, who have not delayed to turn them with damaging effect upon the measure he proposes. That any considerable extension and cheapening of telegraphic facilities would induce a great many people to use the wires instead of depending on the slower post, no one questions. But it is far from clear that the benefits to the community, educative or otherwise, would be at all commensurate with the cost.

Low tariffs would certainly increase the number of messages; but if the experience of the rest of the world is worth anything, the increase of business would not necessarily make the low rate remunerative. Indeed wherever the experiment has been tried, the adoption of a low tariff has uniformly resulted in a loss. As Sir James Anderson, regretfully admits, after an exhaustive study of the subject, "a reduction of tariff leads to a diminution of the net profit, even under the most favorable conditions known." This result, so contrary to experience in every other form of industry, is not difficult to explain. Unlike other kinds of business, the principal cost in telegraphing is labor, the amount of labor, and consequently the expense, increasing in close ratio with any increase in the number of messages. To double the business of any properly regulated office, would require twice as many clerks and operators; and if the line were working anywhere near its full capacity, the increase of business would necessitate a corresponding increase in the number of wires, and the aggregate cost of their maintenance. This fact alone makes it hopeless to expect any such reduction of rates as the advocates of a postal telegraph promise, and a self-supporting system at the same time. The full cost of the transmission of messages must be paid. If the original charge is insufficient, then the deficiency must be made up by the public at large, by taxation in some form or other, as is done in every country where low tariffs have been adopted; and the same argument that would justify a subsidized telegraph as an educator would justify the subsidizing of churches, newspapers, private schools, and a hundred other worthy enterprises which the spirit of our institutions forbids us to make a public charge.

But, it is urged, existing telegraphic rates are nevertheless exorbitant, and ought to be greatly reduced. Of this we lack data for a positive judgment. Still it is clear that the case is not nearly so bad as some have asserted. Mr. Creswell relies largely on the experience of Great Britain in postal telegraphy. There the rate is one shilling. Here the average rate of messages is about fifty cents. There the extreme length of line is six hundred miles. Here it is six thousand. There the country is old, the population is dense, the highways are solid and secured, and the cost of materials and labor much less than here. [In the matter of wire, the Americans there pay a duty of sixty per cent.] Here the country is largely new and sparsely settled, the routes are constantly changing, the expense of construction, repair, and maintenance relatively great. As the purchasing power of a shilling in Great Britain is not very much less than that of half a dollar here, it is claimed, with a fair show of reason, that the average American tariff, within a range of 6,000 miles, is not extraordinarily greater than the British tariff within 600 miles. Taking into account the half rate night messages, peculiar to this country, it would seem that the charges of extortion and the like, brought against our American lines, are too fondly sustained by fact.

It may be worth noticing, in this connection, that the English post office carries letters for one penny, delivering them with greater promptness and frequency than has been attempted here, and makes a profit of five million dollars a year. Our postal department carries letters for three cents, without delivery, except in the larger cities, and runs behind something over five millions a year, not counting the interest on the millions invested in post offices and other postal property. The English postal telegraph is a losing business. What might we expect of an American system?

It is urged that, under government control, the telegraphic business of the country would be more economically administered than now, making a corresponding reduction in the rates at least possible. It may be; still, our experience in the matter of canals and other government works does not offer much encouragement to this view, nor does the experience of those governments which have adopted the postal telegraph. The London office, for example, employs more than three times as many clerks and operators as are employed in the Western Union office in this city, to handle about the same number of messages daily. If messages were transmitted with a corresponding greater degree of promptness and precision, the increase of working force might be justified; but they are not. Already the complaint is raised that, while cheapness has been gained, by the change from private to public management, the main advantage of a telegraphic message, speed of transmission, is, to a great extent, denied. Red tape has developed itself, as in all other government operations, and frequently a message is delayed for hours, waiting for the proper official to sign it.

As to the doubtful questions of private telegraph management, it is enough to observe that the fidelity of the companies to the secrets entrusted to their care certainly compares favorably with that of the mail office; and it is because a government responsible for the size of the customs house and the revenue service is very much about possible breaches of trust on the part of men whose character is yet unimpeached.

It is true that the newspapers are largely dependent on the telegraph companies. Would they be less dependent on the government if it should assume control of the wires? Are private companies more likely to tamper with news to suit their own purposes, or have they more purposes to subserve than the government? We have the censorship established by France and Russia as a warning; and even without a censorship, the opportunity a government telegraph would have to make itself the only medium of public opinion, by discriminating against obnoxious journals, is not a matter to be lightly considered. Then the risk of government espionage, in private as well as political messages, is at once serious as well as inevitable. Think what mischief could be wrought by a few Jaynes and Sanborns as irresponsible telegraph managers!

And here we touch the most serious objection of all to the proposed postal telegraph. Private management is pretty sure to put the right men in the right places. The incompetent and untrustworthy are weeded out by an inexorable law of natural rejection. Could we expect the same under government management, with our complicated and corrupt civil service? The telegraphic service calls for special training and fitness for the work. So long as partisan zeal and election day services count for more than personal worth or business ability in securing official appointment, there is not much encouragement to expect any remarkable improvement in the personnel of the telegraphic system under federal control. Besides, the advantage of an increase of forty or fifty thousand to the army of political appointees, already too numerous, is not strikingly apparent, save perhaps to the party in power.

The Hubbard scheme avoids this difficulty in some degree, yet opens the way to other evils quite as objectionable. The partnership it provides for between the general government and the proposed Postal Telegraph Company is remarkable rather for the skill with which the profits are diverted to the corporation, and the risks and responsibilities to the government, than for any improvement it offers on the existing system. True, it promises a reduction in the tariffs, but any concessions of this sort are more than compensated for privileges and immunities demanded, the burden of which must necessarily fall upon the public at large. In other words, the multitude who rarely need or use the wires must be taxed to cheapen the telegraph for the few whose business or pleasure calls for frequent messages.

A DESERVED HONOR TO AN AMERICAN ASTRONOMER.

The highest honor in the gift of the Royal Astronomical Society of England, a gold medal, has recently been awarded to Professor Simon Newcomb, Astronomer in Chief of the United States observatory at Washington, for his tables of Neptune and Uranus, and for other important and valuable contributions to astronomical science. Professors Adams and Cayley, Mr. Glaisher, Sir G. B. Airy, and many other eminent English astronomers were at the session of presentation, which took place at Somerset House, London.

The President of the Society, in his address, reviewed the earlier efforts of Professor Newcomb; and in reference to the above mentioned work remarked that it embodies results only attainable by the exercise of immense labor under the guidance of profound mathematical skill. Its title is "An Investigation of the Orbit of Uranus, with General Tables of its Motion," and it has been under the immediate supervision of the author for some fifteen years.

MACHINES TO MAKE PEOPLE HONEST.

Time was, when almost every stage driver in New York was known to abstract a greater or less share of all fares received, and his employer had no remedy and no sure means of detecting the rogue. But thanks to the ingenuity of the inventor, our Broadway Jehus have been transformed into honest men. They can't steal if they would. The patent money box, in which the passenger drops his fare, relieves the driver from the duty of handling the money, and consequently none sticks to his fingers.

On the street railway cars, the pilfering conductor although not rendered wholly honest, is considerably interfered with and his stealings reduced by means of the patent bell punch. He is required by the rules to punch a strip of paper for every fare received. The punch contains a bell, a dial numbering register, and a receptacle in which the punched bits of paper are received. The punch, paper, and money, are returned to the office by the conductor at the end of every trip. The dial pointer shows how many times the punch has been operated, and the count of holes in the paper, the punched bits within the punch, and also the money, should be all found to agree. Any discrepancy is at once shown. But this device does not fully answer the purpose of detection, because the conductor may take fares and not work the punch, especially in a crowd, without being observed.

The money box plan, is apparently the surest. There is a chance for some ingenious person to invent a portable box for conductors, which will be promotive of their integrity in crowded cars.

One of the latest dodges in this line comes to us from Constantinople. The driver or conductor of the car gives to every passenger a prize ticket bearing a number which is recorded on the company's books. A drawing takes place monthly, the company providing a certain number of prizes. We read of one passenger who lately drew a prize of $100 in this way. The hope of drawing a prize makes the passenger careful to send in his tickets; and if the money returns of the driver or conductor are not equal to the number of tickets returned, there is a showing of dishonesty, and the particular culprits may be detected by comparing the return tickets with the records of the tickets issued to the several conductors.

THE PALACE OF MONTEZUMA.

The ancient palace of Montezuma, in the heart of the city of Mexico, where that unfortunate monarch was seized and made captive by the treachery of the Spaniards under Cortez, is described as having been a place of great magnificence. It was full of sculptured arches, pillars, and beautiful fountains. On the consummation of the Spanish conquest, it was converted into the Roman Catholic convent of San Francisco, and became one of the most wealthy and powerful religious institutions of the kind in the New World.

Church and State have, until within the past few years, been always united in Mexico; but a few years ago, under President Juarez, the Congress decreed a separation, and ordered the sale of all church property.

The American Methodists bought the palace last year for mission purposes, for the sum of $16,000, and, on last Christmas day, having cleaned up and repaired the building, it was publicly dedicated to Protestant worship. The walls are five feet thick, and it is built in the most strong and enduring manner. Much of the beautiful original sculpturing still remains, and it could not now be reset, it is said, for less than $100,000. The Methodists have room upon the premises for printing offices, schools, parsonages, etc., and expect, one of these days, to make it the center of a very extensive scene of educational operations.

THE SUPPLY OF CARBON FOR GUNPOWDER.

It is a very remarkable fact that, with all the discoveries of modern chemistry in the field of explosive compounds, the old-fashioned gunpowder, made of saltpeter, sulphur, and charcoal, has, for the purpose of fire arms, large as well as small, been adhered to and found to be the best, safest, and most reliable of all.

The proportion of these ingredients is of course such that the oxygen required for the combustion of the charcoal is present in the niter, while the sulphur combines with the potassium. Theoretically, gunpowder should therefore consist of one atom each of niter and sulphur, and three atoms of charcoal, corresponding to the formula $KO, NO_5 + S + C_3$. Reducing this to percentage, according to the atomic weights, we have 75 parts niter, 11·77 sulphur, and 13·23 charcoal, which is very nearly the proportion of the best qualities of gunpowder, and is adopted for the Prussian army. Theoretically considered, the combustion changes this formula into $KS + N + C_3O_6$, or about 40 per cent potassic sulphide, 10 nitrogen, and 50 carbonic acid; but experiments instituted in Austria, by burning gunpowder in small quantities at a time in closed vessels, revealed the fact that the products of combustion are much more complex, producing, besides carbonic acid gas and nitrogen, also carbonic oxide and traces of sulphide of hydrogen, about equal in weight to the solidifiable vapors, which consist of 56 parts per cent sulphate and sulphite of potash, and some 30 per cent carbonate and hydrate of potash; while 10 per cent unburnt carbon and 4 per cent niter were among the solid residue. It has, however, been objected, and not without ground, that the explosive combustion in mass in a gun produces results other than those of the gradual combustion to which the gunpowder was submitted in these experiments.

The strength of gunpowder is augmented by increasing the niter and charcoal, and diminishing the sulphur, of course within certain narrow limits; 75 parts niter, 10 sulphur, and 15 charcoal is the strongest powder, while 77·4 niter, 8·5 sulphur, and 13·8 charcoal is the quickest; 65 niter, 20 sulphur, and 15 charcoal is slow, and "strains," as the workmen call it; it is capable of raising large masses, and therefore is used for blasting.

The temperature of the ignition of gunpowder is at least 5,000°, and the pressure exerted against the walls of the confining vessels is estimated at about 5,000 atmospheres, or 75,000 lbs. to the square inch.

The quality of the powder depends, of course, on two conditions, the quality of the materials and the manipulation, the latter being the mixing and graining. The object of graining is to afford an instantaneous passage of the flame through all the mass, by the interstices between the grains; and this effect is shown by the fact that meal powder will not explode powerfully. In regard to the materials used, it is easy to obtain sulphur in a condition of sufficient purity, or to purify it when necessary. The saltpeter, also, gives now no difficulty, although in former ages it was sometimes scarce; but since the discovery of the deposits of Chili saltpeter (nitrate of soda), and its easy conversion into common saltpeter, and the deposits of chloride of potassium in Germany, there is no longer any trouble. But with the charcoal, there is always a permanent difficulty. Ure, in his "Dictionary of Arts and Manufactures," says that: "Charcoal is considered by the scientific manufacturers to be the ingredient most influential, by its fluctuating qualities, upon the composition of gunpowder, and therefore it ought always to be prepared under the vigilant and skillful eye of the director of the establishment."

Experience has shown that willow, poplar, and dogwood are the best woods for making charcoal for gunpowder. They are burned in retorts, and care is taken to leave them not entirely black, so that some of the hydrogen remains in the wood. Analysis of the charcoal, found by experience to be the best adapted for gunpowder, has shown that it contains a much greater proportion of hydrogen than ordinary charcoal. It is not a little singular that we possess (in Western Virginia) an extensive deposit of a carbonaceous mineral, which has been called grahamite, and has the same composition as gunpowder charcoal. It is, like coal, a result of the carbonization of wood, but differs from coal, asphaltum, albertite, and similar substances in its properties. It swells up when exposed to heat by the evolution of hydrogen gas, and is so exceedingly and powerfully combustible that the air in the mine where it is obtained, when charged with the dry dust of the mineral, has exploded like a mixture of air and coal gas. It has been proposed to use this mineral as a substitute for charcoal for the manufacture of gunpowder, as charcoal is very difficult to obtain in uniform quality, while of this mineral immense deposits are found, of perfect uniformity. Being identical with the gunpowder charcoal in its chemical composition, favorable expectations were entertained, which having been confirmed by some experiments proving it to make a most powerful blasting powder, the principal powder mill in the United States is now engaged in making powder with this material as one of the ingredients.

As gunpowder has been called the great civilizer, and nations which possessed one of its three ingredients have been envied, it is not a little remarkable that the United States should possess an inexhaustible supply of an excellent substitute for the only vegetable ingredient entering into its composition, about which there has always been some uncertainty and trouble.

OUR NAVAL EFFICIENCY.

To any one who has labored under the conviction that our navy, though small, is nevertheless, taking into consideration the class of vessels of which it is composed, of the highest possible efficiency, the reports of the late fleet drill in Florida Bay are especially discouraging.

A larger number of first class ships than ever before has been collected under a single commander are sailed around for several days; and as a result, we are informed that they, practically the cream of the navy, cannot maintain a speed of six knots per hour in company. In other words, if attacked by a squadron of fast foreign iron clads, they could not, if worsted, run away; or if falling in with swift sailing merchantmen, they could not catch them. In letters from officers of high rank, we find it stated, in brief, that our crack wooden ships are practically valueless, that they are loaded down with a mass of rigging which would hamper their efficiency in combat, and that, so far as the experience of the various squadrons, the war vessels of the future should be swift steam rams, devoid of sail except such as is a necessity for their safety in stormy weather.

Another fact, equally unpalatable, is that in connection with the torpedo practice. During the course of the drill, the vessels were required to attack a floating target at a speed of four miles per hour and to explode torpedoes from the ends of booms rigged out for the purpose. Some ships fired their charges at the right time and smashed pieces off the target; more did not, and only succeeded in blowing up huge columns of water.

About the only fact evidenced was the absurdity of supposing that an enemy's ship would stand still or slow down to let a vessel stick out a long boom with a lot of rigging and a torpedo on the end, slide up at the rate of a mile in 15 minutes, poke the torpedo carefully under her water line and fire it, when a single charge of grape at short range would smash boom, rigging, torpedo, and operators into fragments. Our ships were strictly limited to four knots speed, and the operations were supposed to be as closely as possible a reproduction of what would be done in action.

We spent millions, not long ago, for vessels which were to steam 16 knots per hour and carry powerful batteries. Their hulks may now be seen slowly rotting in the navy yards, or else altered into slow craft. "Isherwood's costly failures" is their generic name. We are maintaining a torpedo school, sending boards of officers to Europe to report, and trying new inventions of submarine warfare, and yet the first really practical trial of the efficiency of an important branch of the system amounts to nothing, and proves nothing except that an inventor is needed who will devise a new way of adapting the torpedo as an offensive arm to vessels of war.

THE PROPOSED IRRIGATION OF THE COLORADO DESERT.

Senator Jones, of Nevada, proposes soon to bring to the attention of Congress a scheme which, though of colossal magnitude and involving an immense expense, seems nevertheless to find a warranty in the vast benefits which, the projector considers, will be gained by the undertaking. Though great as it is, in these days when we turn continents into islands by canals as huge as small rivers, when we tunnel under mountains, and construct structures reaching almost to the clouds, when we alter river courses, and convert great tracts of swamp into available land, there is really nothing very startling in the suggestion of irrigating a great desert. The objective point of Senator Jones' plan is the vast waste known as the Colorado desert, which stretches from Lower California to Inyo county in the State of California, and from the base of the Coast Range Mountains to the Colorado River, comprising an area about 300 miles long by 150 wide. At their private expense, Senator Jones and a citizen of California recently fitted out a surveying expedition; and from the report of the engineers, it appears that the whole tract may be reclaimed by turning into it the waters of the Colorado River or of the Gulf of California. A large portion of this desert, we learn, consists of fertile soil which is in a deep depression, susceptible to the highest cultivation. It is also shown that the prevalence of sand storms, hot winds, and deficient rain falls, evils suffered by the adjoining country as far north as the Tulare valley of California, is directly traceable to this arid expanse, from which, as from a great furnace, there constantly rises a vast column of heated air, without appreciable humidity. Thus the moisture of the rain bearing clouds which are blown northwesterly during the summer months from the Gulf of California, is dissipated as soon as they reach the border of this superheated region, and they are prevented from reaching the dry but fertile plains of California beyond.

Mr. S. E. [illegible], an eminent civil engineer of San Francisco, in commenting on the report, points out that shells found on the surface of this desert prove that it has been at one time the bed of a sea, and at a subsequent period the bed of a fresh water lake. The shore lines of both sea and lake can still be seen and recognized in many places; and Mr. [illegible] expresses the opinion that the Aztec civilization of the adjacent region in Arizona (of which there are so many traces) came to an end in consequence of the climatic changes caused by the evaporation of these vast lakes in Southern California, after the Colorado River had cut down its bed in the great cañon so deep that its course was diverted at Colville to a southerly direction.

The question is suggested whether these desert basins cannot be reclaimed by irrigation, and thus saved, instead of being totally submerged, as it is considered certain that covering them with vegetation would tend to prevent the evaporation of moisture, and at the same time act as a precipitant for whatever moisture the atmosphere may carry, or whether both plans might not be combined.

THE WHITEHEAD FISH TORPEDO.

For some time past, the European scientific and military journals have devoted considerable attention to the subject of the Whitehead fish torpedo. The secret of this invention, it seems, has been judged as of sufficient importance to warrant the expenditure, by foreign governments, of large sums for its possession. France paid $40,000, Italy, $44,000, and England, $80,000; and as far as the trials instituted by the two former countries extended, the results obtained showed the device as of very high efficiency. The latest experiments conducted at Woolwich, by the English government, have, however, been less successful, and a destructive premature explosion has brought the torpedo both into greater public prominence and also engendered widespread controversy as to its value.

The secret of its construction, although heretofore well guarded, it appears has leaked out; and from an English military contemporary, we learn that the apparatus consists in a fish-shaped body, twelve feet long by sixteen inches in diameter, with a compartment at each end closed by a bulkhead, and an engine room in the center some eighteen inches in length. The whole is constructed of malleable steel, three sixteenths of an inch thick and hammered upon formers. The motive power is compressed air, which is contained in the rear compartment and thence conducted to a little oscillating engine constructed on the compound principle.

The pressure is regulated by a powerful spring gage, the piston of which, descending, keeps a blast passing into the engine with tolerable evenness at about 900 lbs. to the square inch. The engine actuates a small screw propeller. There is an ingenious automatic steering arrangement, consisting of two balance weights suspended in the center compartment, so that, when the equilibrium of the torpedo is disturbed, these weights touch one side or the other of the shell, striking a lever which communicates with steering fins at the tail end. The fins are behind the propeller and act as rudders, so that, towards whichever side the torpedo heels over, the corresponding fin is set in motion, and corrects its movement by giving a contrary impulse. The explosive material is contained in the forward compartment.

The report of Commodore Kirkland and Master [illegible], of the United States navy, now before us, sets forth the performances of the torpedo during the trials conducted, a couple of months ago, by the Italian government. The main point to be determined was whether the fish would, after being lowered down just below the surface of the water in a directing tube, and then started, proceed in a direct line for several hundred feet. The result of the experiments proved that the torpedo would run 600 feet in 33 seconds, that is 10½ knots per hour, under 50 atmospheres pressure, and maintain its direction perfectly at 4 and 5 feet immersion; that it would run 4,000 feet at 7 knots per hour under 37 atmospheres with a slight deviation; that the device could be easily launched and accurately directed from an ordinary boat, and that changes of depth can be effected at the will of the operator, without impairing the qualities of the torpedo in any way. In conclusion, the reporting officers endorse the apparatus in the highest terms.

So far as we are able to judge from the account of the official investigation of the Woolwich explosion, the disaster was the result of inevitable accident, and does not militate against the invention to any grave extent, at least not to the degree which the *Army and Navy Journal*, in discussing the subject, presupposes: 129 runs of this description of torpedo had previously been without accident, and the apparatus which blew up had already been tried nine times. Its metal had been previously tested to 1,200 lbs; and after the disaster, a fragment was subjected to a strain of 100,000 lbs., without flaw. It burst at 800 lbs. and while in a perfectly quiescent state, the operators being engaged in oiling the bearings previous to starting. Dismissing this defect, therefore, as one due to faulty construction in but a single instance, it would appear that the Whitehead torpedo is thus far the most successful of any of the self-governing submarine offensive arms. The circumstances of the Italian tests were calculated to try the advantages of the invention severely, and that it went through them successfully is strong evidence of its efficiency.

[Continued from first page.]

liquor casks, or other light work. It is easily adjustable, and hence is well suited for acting on barrels of different sizes, and will, we were informed, truss with perfect evenness from three to five hundred oil, or from ten to fifteen hundred sugar or flour, barrels in a day. The manufacturers claim that it will do the work of twenty men, and requires little or no repairs.

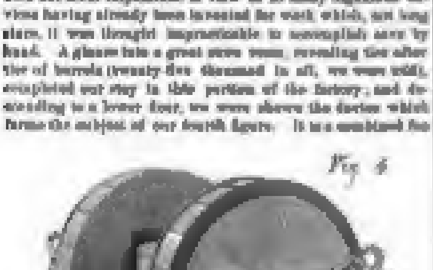
The barrel which we had followed through its various manipulations, now being heated and trussed, was next passed to a machine which is unquestionably an invention of extraordinary merit and ingenuity. Our artist has represented it in Fig. 3 as it appears in operation, the moment selected being that just after a finished barrel leaves and a rough one enters. If the reader will notice the three casks on the skids in the foreground, he will observe that the edges are irregular, due to the varying length, etc., of the staves. Now, before the heads are put in, each cask at each end must be crozed and chamfered: that is, a groove must be cut around the inside, a short distance below the edge, while the latter must be beveled off. Besides, the ends of all the staves must be cut off perfectly true. Every one at all conversant with coopering understands that this work, when done by hand, is the most difficult and requires more time than any labor about the barrel; and this is even augmented when, in heavy casks, it is also necessary to cut a howel, or wide concentric indentation around just below the croze.

Some idea of the efficacy of the machine shown in Fig. 3 will therefore be formed when we state that it chamfers, howels, levels, and crozes a cask of imperfect periphery with the same exactness as if it were a perfect circle, finishes both ends at once, and turns off from 800 to 1,200 barrels per day with ease.

The barrel passes from the skids directly between the chuck rings, and its ends fit into the peripheries of the cog wheels which work within the former. The workman, in our engraving, is shown turning the wheel, which, through suitable gearing, governs the backward and forward motion of the right hand ring. The other chuck ring is stationary. As the barrel falls into place the workman brings his ring up, thus confining it; then, by a pull of a lever, he throws a clutch into gear, which results in the rapid rotation of the barrel. Finally, by manipulating a third lever, he brings the cutters—which perform the above mentioned operations, and which are all fastened to two circular heads, the shafts of which are mounted on vibrating carriages and revolved by the two smaller belts represented—up against the inner edge of the barrel. One revolution of the latter and the work is done. The ring is drawn back and the cask rolled out, with the work of hours (by hand) finished in a few seconds. Each cutter head is controlled by a rest upon the outside, thus compelling a uniform thickness and depth of chime, while the same is leveled in a perfect manner. By proper sized chuck rings, any kind of barrel may be operated upon, and the change from one size of ring to another is very easily effected.

From this point, we were told, the rest of the work upon the barrel is best done by hand. We saw the casks, as they left the machine just described, pass to an elevator, and thence to an upper loft, where an army of men were busily putting on the hoops, setting the heads in place, and otherwise completing the labor. Barrels differ so much in shape that it would be hardly practicable, it is said, to substitute machinery in this department; but to the casual observer it does not seem impossible, in view of so many ingenious devices having already been invented for work which, not long since, it was thought impracticable to accomplish save by hand. A glance into a great store room, revealing tier after tier of barrels (twenty-five thousand in all, we were told), completed our stay in this portion of the factory; and descending to a lower floor, we were shown the device which forms the subject of our fourth figure. It is a combined fan

Fig. 4



BARREL MAKING.—THE STAVE JOINTER, WITH FAN.

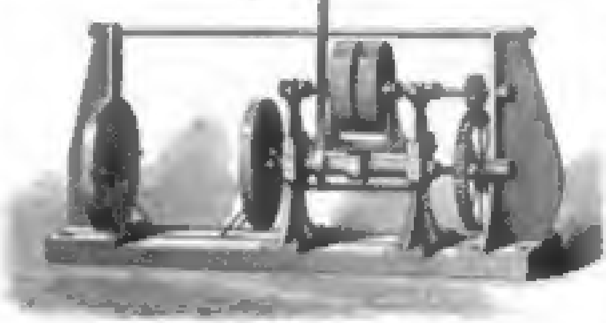
and stave jointer, that is, it holds the staves firmly and cuts the joints on their edges, leaving each piece in the proper form to take its place in making up the barrel. It was used in the establishment which we visited to rejoint staves which had their edges split, or which otherwise were imperfect. Its principal advantage is that, in addition to occupying but little room, it gives off no dust or shavings to create nuisances in journals and boxes, or to afford ready tinder for the reception of stray sparks. All the débris is blown through suitable conductors to the fuel room. The apparatus works with great ease. When a stave is to be changed, the stave holder is brought to bear upon it, and it is brought in contact with the jointer by the foot of the operator. As soon as the foot is removed, the clamp, by self action, releases the stave, and is ready for another. A stave, it appears, cannot become loose or move until the clamp recedes from the cutters.

Lack of space prevents our entering more in detail into these machines, or entering into explanation of other barrel making devices constructed by the manufacturers; suffice it to say that illustrations and descriptions will probably follow in these columns, of a variety of other machines for like purposes, made by the same firm, Messrs. E. & B. Holmes, of 59 Chicago street, Buffalo, N. Y. Parties desiring further information may address as above.

Cure of Rheumatism in a Horse by Electricity.

S. D. Powell, M.D., in the *Irish Farmers' Gazette*, describes the cure of a valuable horse by means of electropuncture needles, from four to six being inserted in the principal muscles of the fore quarters, also along the spine and hind quarters. The battery employed was that of Leclanché, from four to twelve large cells, alternating in strength, and the current broken, causing the muscles to contract perceptibly. This was kept up from two to three minutes at each place. Prior to treatment, the animal was in so bad a condition that the owner was about to cause him to be shot. But within about six weeks after the commencement of the electrical treatment, the horse was perfectly restored, and is now sound and useful.

Fig. 3



BARREL MAKING.—THE LEVELING MACHINE.

IMPROVED SPIKE BAR.

Railroad employees are well aware that bars for drawing spikes on tracks are very liable to become broken. The point at which they usually fail is at the claws; and necessarily if one of the latter is destroyed, the bar is rendered useless until it can be repaired. This occasions much inconvenience and delay, but a remedy for the trouble is now offered in the invention herewith illustrated in perspective, Fig. 1, and section, Fig. 2, which consists in making the claws in separate pieces, and attaching them to the bar so that, if either claw fails, it can be removed and another quickly substituted.

Fig. 1 Fig. 2

The lever is formed with a square or angular socket, A, in its enlarged end, and the claws, B, are made with shanks which fit into and fill the space. Shoulders, D, are made upon each claw to rest against the end of the lever. C is a pin which passes through a hole which is bored through the socket and through the jaws so as to cut a half circle from each shank. The pin is made somewhat tapering so as to be readily withdrawn.

The claws may be made in pairs to fit spikes of different sizes or to adapt the bar to other purposes, as may be desired. The pin, C, holds them in place and may be easily removed when it is desired to change them.

Patented through the Scientific American Patent Agency, October 28, 1873. For further information address the inventor, Mr. George Douglass, 18 Water street, Bridgeport, Conn.

Peat Coal.

Kidd's process for carbonizing peat consists of a large chamber or drying room connected with a boiler which supplies superheated steam; from the boiler a steam pipe passes through the furnace, and from thence into the flue: the steam, in its passage over the boiler fire, becomes superheated, and, together with the smoke, passes into the drying chamber; the peat, cut into pieces about the size of bricks, is put into a framework which runs upon wheels, so that it easily runs into the drying chamber and is run out again when finished, thus saving a great deal of labor. The object of Kidd's process is the collection of the heated gases of the furnace in a closed chamber, where they may be usefully employed in charring peat, or converting it into charcoal; artificial draft is created by jets of superheated steam, and the whole products of combustion from the furnace are forced into and retained by the closed chamber. The chamber is filled with peat, which may be dried and charred in less than forty-eight hours by the action of the furnace gases and superheated steam; the temperature of the chamber rises close to between 700° and 800° Fah., and remains at some temperature between these limits. By charring the peat at a low temperature the loss of hydrocarbons is very small, the gases which are passed into the chamber being for the most part non supporters of combustion; consequently it is impossible for the peat to take fire during the process of charring. The fuel used in the furnace which supplies the gases and generates the steam is peat, which has been partially dried in the open air. It is estimated that a ton of peat charcoal can be produced by this method at a cost of $6.25, which sum includes all charges for interest on capital, royalties, machines, raw peat at 72 cents a ton, that used for fuel, $1.8 per ton. Peat thus prepared produced a gas of high illuminating power, ranging between 20 and 26 candles and 7,000 and 9,000 feet per ton; the gas is generated so quickly that three charges of peat can be worked off to one of coal, thus effecting considerable economy in the plant of gas works. The charcoal which remains after the gas has been extracted is also much more valuable than the ordinary coal gas coke. There is, no doubt, a large field open for commercial enterprise in the manufacture of peat charcoal, owing to its freedom from sulphur and its affinity for oxygen at a high temperature. It is equal to ordinary charcoal for refining iron, steel, and other metals, as a fertilizer, and for filtering water and town sewage.—*Chemical News.*

TOSELLI'S SOUNDING APPARATUS.

The *Revue Industrielle* reports the invention of the novel sounding device, represented in our engravings, by M. Toselli, an Italian engineer officer. It is composed of two

arms, A B, which are pivoted in the support, C, and which carry on their extremities cups, E F. The lead, F, is fixed to a rod, D, which has a T shaped head, which, as represented in Fig. 1, drops down over the upper and curved ends of the arms and holds them open. In using the device, it is lowered until the weight strikes the bottom, when the T head is caused to lift and free the arms, which fall by their own gravity. The depth of water is noted in the usual way, from the lead line; hence the particular advantage of this invention is that it brings up with it specimens of the bottom inclosed between the two cups, which meet as shown in Fig. 2. The T head on the weight rod, it will be noticed from the last mentioned engraving, drops, when the arms are closed, into notches on the upper end of the latter, thus securely preventing their opening.

Fig. 2

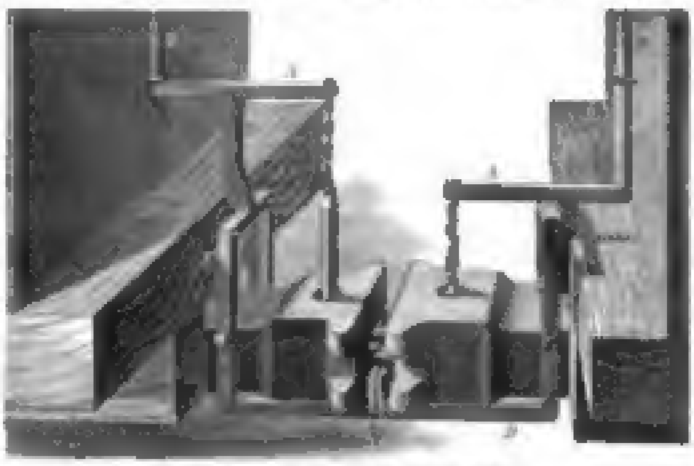
STILES' IMPROVED CAR COUPLING.

The invention herewith illustrated is designed to couple cars together automatically, and to afford simple means whereby the mechanism may be readily adjusted for operation. The necessity which exists for improved apparatus of this description, and the general advantages to be gained by an efficient self-acting device, have already been fully detailed in these columns, so that no reiteration of the facts is here deemed necessary.

The present invention consists in an arm, A, connecting with a vertical rod, B, which leads upward through guides to the end of the car, and with a bar, C, which enters a groove in the block above the drawhead. The lower end of this bar is widened and inclined at its front portion, so as to force the upper end of the elbow frame, D, forward, and rise above it when the coupling pin, which is suspended from the arm, A, is to be pulled out. The lower extremity of the bar, C, then rests upon the elbow frame, as shown on the left of our engraving. This frame is pivoted to the drawhead at E, and is provided with springs at F, which pull its top back under the bar, C, as soon as the latter has been raised high enough to lift the pin out of the link and hold the same ready to let it fall when required. Below the drawhead, the frame, D, supports a plate, G, which rises a little above the bottom wall of the opening for the link, so as to hold the outer end of the latter up to enter the drawhead of the other car.

When the two plates, G, of the cars meet, the upper ends of frames, D, are thrown forward out from under bars, C. They therefore fall, and the pins, descending, slip through the link. It is proposed to have the rods, B, extend to the tops of freight cars, so that the brakeman on the roof can easily lift the pin and adjust the coupling.

Patented through the Scientific American Patent Agency, February 10, 1874. For further information address Messrs. Stiles & Carlow, Bloomfield, Davis county, Iowa.



STILES' IMPROVED CAR COUPLING.

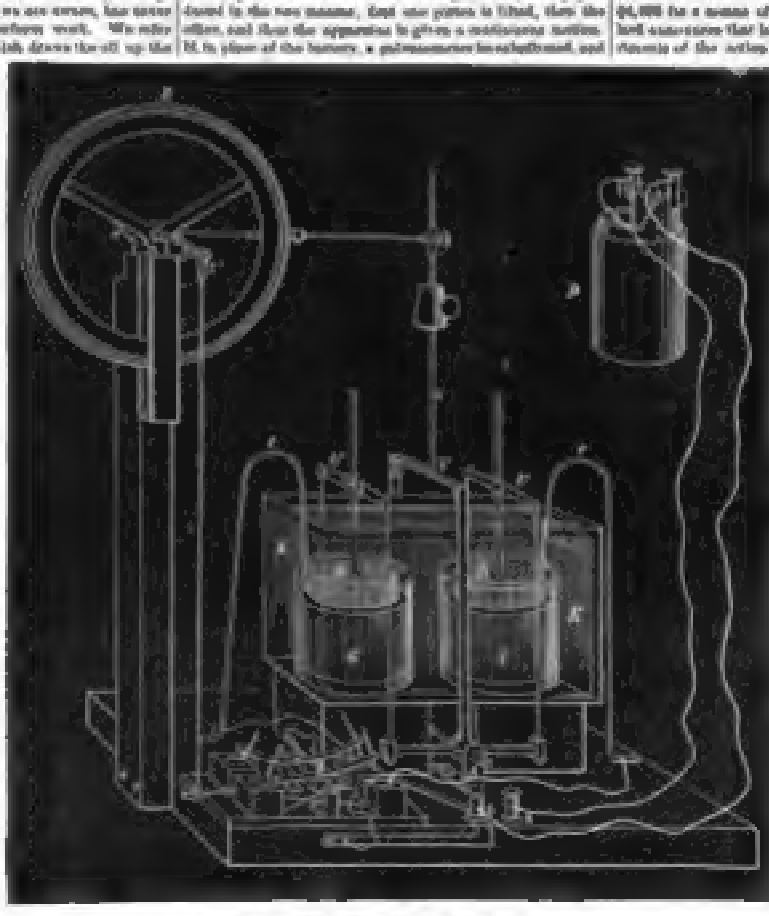
A NEW MOTOR—THE ELECTRO-CAPILLARY ENGINE.

We extract from the pages of *La Nature* the annexed engraving of a curious machine which has recently been invented in France, and which relies for its motive power upon a natural force which, so far as we are aware, has never before been directly utilized to perform work. We refer to capillary attraction—the force which draws the oil up the wick of a lamp, to cite a homely and familiar example—and to the phenomena of which physicists have devoted no small amount of profound study. Although the laws governing this branch of science have been discovered and mathematical formulæ deduced in accordance with their workings, it has remained to devise a means to harness the force and compel it to drive machinery. This means, the inventor of the present apparatus believes, is electricity.

There is a simple experiment which any one of our readers can perform for himself, and which will at once render clear the operation of the motor we are about to describe. Place a drop of mercury in the bottom of a glass and fill the latter with water slightly acidulated with sulphuric acid and also treated with a few drops of bichromate of potash. If now the mercury be touched with an iron point, it will be observed to contract quickly, and to take a a new form, which it will maintain until the point be withdrawn, when it will resume its former shape. These alternate contractions and expansions, it will be found, can be made to succeed each other as rapidly as the point can be applied and removed; and when a large drop of mercury is used, they become so vivid as to be quite amusing. It is the galvanic current which is produced by the iron, the acidulated water, and the mercury, which changes the force of the capillary attraction, for it is this power which, in the beginning, keeps the drop of quicksilver in its globular form and prevents its spreading or flattening out.

In our illustration, E is a glass vat filled with diluted sulphuric acid, in which are placed two smaller vessels, O, in which the mercury is placed. In each vase is plunged a bundle of glass tubes, B, all arranged vertically and open at both ends. Each bundle floats on the mercury and is connected with a rod which carries a horizontal crosshead, C, from which extend downward other rods, which are attached to the extremities of the pivoted lever, A. The bundles of tubes, B, correspond to pistons, and, by alternately moving up and down in their chambers, impart an oscillating motion to the lever, A, thence to the frame, V, rod, S, crank, R, and, finally, belt or fly wheel, R. The mechanism thus far clear, we pass to the mode of developing the power, and this a single element, D, of a Daniell battery. By means of the bent iron wires, c, the current is brought in communication with the mercury. If carried to both vessels together, it is evident that the change in both would be produced at the same instant, and equilibrium between them would result; but if so arranged as to be applied to each vase alternately, then it is clear that first one piston and then the other would be acted upon, and a vibrating movement of the lever, A, be the result. To effect this, the fly wheel, R, by means of the crank, c', is brought in connection with a commutator, W, which so governs the current as to establish or break it in either vase, on the same principle that the slide valve of a steam engine shuts off or admits steam. Then, by reason of the constant changes, in capillarity produced in the two masses, first one piston is lifted, then the other, and thus the apparatus is given a continuous motion. If, in place of the battery, a galvanometer be substituted, and the wheel, R, turned by hand, the needle will at once indicate the existence of a current.

It is of course hardly probable that any amount of useful power can be gained from this machine, but it is nevertheless a very ingenious device, and one which, perhaps, may prove a valuable suggestion for other applications of the same force.



THE ELECTRO-CAPILLARY ENGINE.

SCIENTIFIC NOTES FROM THE FRENCH ACADEMY OF SCIENCES.

From the reports of recent sessions of the French Academy of Sciences, we glean the following interesting morsels of scientific intelligence.

France, it seems, has experienced a unusually mild winter. M. Tarsin has investigated the matter and thinks that he has found a great atmospheric current crossing the country, which bears about the same relation to the atmosphere as the Gulf Stream does to the ocean. This current becomes displaced in longitude; and according as a given region is in the center or on the borders of the aerial flood, the winter is calm and mild or else visited with cold and storms.

Good results are communicated to the Academy from experiments in using a [illegible] tannate of protoxide of iron as a preservative of wood. The tissue on injection becomes thoroughly impregnated with a veritable ink, which prevents the destroying action of the weather. M. Moniez sends some curious specimens which, though seeming to be very hard graphite, capable of scratching glass and even steel, are composed of sugar—the residuum after evaporating, probably—heated, away from the air, to a white red temperature. MM. Joly and Barbier suggest that the wires used for electric bells and similar purposes in buildings may be converted into fire detectors if they are simply coated with rubber as an insulator. The idea is that, where the wires at a closed touch, on the heat melting the rubber covering, the exposed copper will come in contact, establishing the circuit, and so sounding the alarm. M. Sivell has constructed a balloon and proposes to ascend higher than 24,000 feet. He believes that pure oxygen, in a compressible state and mixed with the rare atmosphere at great elevations, will enable him to breathe without difficulty. In spite of the numberless preventives suggested, the phylloxera continues its ravages in the vineyards of France. The Minister of Agriculture and Commerce has recently appointed a commission to examine plans, and has offered a prize of $4,000 for a means of exterminating the nuisance. M. Bechard announces that he has completed a long series of experiments of the action of water on lead, and concludes that water containing sulphates and carbonates, attacks the metal very slightly, while the effect of water charged with chlorides and nitrates is very plainly marked.

M. Cailletet has been investigating the question of the variation in volume, of a hollow glass cylinder when compressed from without or within. A tube of glass, 20 inches long and 4 inches in diameter, was broken under an exterior pressure of 77 atmospheres, half of which force, exerted from within, sufficed to rupture it. In using very thick tubes, equal to the resistance of 300 to 500 atmospheres, there is no permanent distortion of the glass.

M. Viginon notes the discovery of some curious crystals of glass extracted from a furnace which had been cold for some time. They differ completely in aspect and form from devitrified glass, appearing in the form of isolated prisms, each some 0·08 inch in length. This composition is different from that of the normal glass of the furnace, as soda is absent, while magnesia is present in excess.

Simple Timber Preservative.

To render posts or timber, placed in the ground, practically impervious to moisture, and for a long time prevent decay, the following simple recipe has been tried and found to answer the purpose excellently. For fence and gate posts, it is particularly recommended:

Take linseed oil, boil it, and mix it with charcoal dust until the mixture has the consistence of an ordinary paint. Give to the posts a single coat of the mixture of paint before placing them, and an farmer, says one who has used it, living to the age of the patriarchs of old will live long enough to see the same posts rotten.

The posts or timber should be well seasoned and dry when the paint is applied.

Correspondence.

Ventilating the Mold.

To the Editor of the Scientific American:

Having had considerable experience in the molding branch of the foundery business, I will endeavor to give your readers some information which will, if proper attention is paid to it, remove a great many of the annoyances that molders have to contend with.

As there is an endless variety of patterns from which the molds are made, it will be necessary to divide them into light and heavy work. Stove castings, as we all know, are very light. In the molding of such work, much depends upon the quality of sand used; the molder's heap should be composed of no more than one half loam, the other half being a very open sand. This makes a good strong mixture, which will not allow the sharp corners and fine ornamental work to be washed away when the molten iron is poured into the mold. In ramming such work, the molder should be careful that the sand on top and bottom of his pattern is not rammed hard; but the sides or edges should be well rammed, in order that the casting may not strain from having a soft parting. Great care should be taken in seeing that the bottom board is well bedded on the flask, after which it should be removed and the vent wire used freely. The venting of the work is often but partially done, on account of the point of the vent wire coming into contact with the pattern; and when the iron enters the mold, it finds its way into said vents, fills them up, and thus, in a measure, prevents the escape of the gas that arises from the iron coming in contact with the charcoal, black lead, or soapstone, with which the mold has been dusted to prevent the sand from adhering to the casting. The bottom board should then be carefully replaced on the flask, and dogged down so that, in the act of turning it over, it could not move, which would cover the vents over with sand. The top part of the flask (or cope, as it is termed by tradesmen) needs the same care in ramming over the pattern as the bottom, and should be well vented. If the mold has any high projections in the cope, they should be well vented; for it is at these elevated points that a large portion of the gas accumulates and needs a quick exit, in order to make sharp corners on the casting and prevent blowing. The straining of castings in this branch of the trade is greatly due to an insufficient amount of weight being placed on the flask, or the parts not being properly dogged together, as well as to the rapidity with which the iron is poured into the mold, together with the hight of the runner. Cutting short the supply of iron as soon as the runner is full, and a careful watching of the work to be poured, will, in most cases, remedy the trouble of the casting being thicker than the pattern.

As to the warping of the plates, much depends upon the quality of iron used and the judgment of the pattern maker. It can often be prevented in a measure by the molder, in making the runner from the round sprue as thicker than the place to be cast; and, as soon as the metal is poured, by digging away in front of the sprue and breaking it loose from the casting. Where a flat sprue is used, this breaking off should invariably be done as soon as the runner is cool enough. It being wedge shaped, with the small end of the wedge downwards, it lifts a portion of the casting in shrinking, and thus causes it to be out of shape.

In heavy work, care and judgment is needed, and it requires a man's lifetime to become proficient in. In ramming work that is to be poured on its end, having a hight of three or four feet, there is no risk in well ramming the sand, for two thirds its hight, around the pattern; and as you near the top, ram it as you would a pattern no more than a foot in thickness. The sand in all such work should be very open or porous, in order to prevent scabbing. As there is so large a quantity of iron used, much steam and gas is generated in the mold; and as there is no other way of escape for them but through the vents, there should be no fault in this particular part of the mold. In the pouring of such work, it is best to run it from the bottom. If a runner is used, do not raise the risers to correspond in hight with the runner, as, by so doing, you increase the amount of strain on the mold; but form a little basin around the risers by ramming out the sprue holes with the finger; and on the side nearest the outer edge of the flask, form a lip for the surplus iron in the runner to run over on to the floor. When heavy work is bedded in the floor too much care cannot be taken in preventing the dampness of the ground beneath from striking through into the mold. The sand that is thrown out of the pit, if it has been of long standing, should not be used for the molding of that piece; for it is too cold and damp, and should be thrown on one side, and allowed to stand that it may dry and warm up. The two or three ladlefuls of iron, that remain in the furnace after the work on the floor has been poured, can be run into pigs in this sand, which will greatly help to fit it for immediate use. In the venting of heavy work, the small vents should terminate in a number of large ones, which should have an opening on both sides of the mold; then a draft would be formed to carry off the gas which is continually forming as the workmen is in the act of pouring the iron into the mold.

All men connected with this branch of the trade have heard that sharp report which immediately follows the pouring of a large piece, the same being caused by the confined gas in the lower end of a large vent, there being no draft to drive it out. Where facing is used, much more care is needed in venting. In the making of large pulleys and gear wheels, too much care cannot be taken in this particular. I hold that not so much depends upon the ramming of such work as upon the venting for the proper exit of the gas from the sand in the immediate vicinity of the mold; for if the mold has been rammed harder than there was any necessity for, and the venting has been properly looked after, there is not much danger of the casting being a poor one. Such work should invariably be run from the hub or center, with sufficient risers, arranged as above described. This branch of the trade is called *green sand work*, and it involves a large part of the art of molding.

Newburgh, N. Y. LEANDER CLARK, JR.

A New Beech Blight.

To the Editor of the Scientific American:

My attention was arrested by the article on page 271, of the *Science Record* (Munn & Co.) for 1874, stating that J. [illegible] observes that: "In Westphalia the beech trees have been recently attacked by a new form of blight, which, commencing on the bark, finally covers the tree with a snow-white down, producing sickness and sometimes death. The microscope shows this blight to consist of fine threads, among which occurs a small insect, apparently an undescribed species. These threads, which are secreted by the insect, consist of wax which has a melting point of 70° or 80°, and the percentage composition of which is: Carbon 81·28, hydrogen 13·28, oxygen 5·03. Both composition and melting point are very near those of Chinese wax," etc. The foregoing is literally a copy.

In the summer of 1867, I noticed a fine beech tree in a valley, which at first sight seemed covered, especially on the lower branches, with snow flakes, so dense and white did they appear; this novel sight, to one well acquainted with the beech tree (*Fagus ferruginea*, Ait.) arrested my especial attention. Supposing it to be occasioned by some minute fungus, I cut off a lower branch for a closer inspection, when I noticed that the white incrustation was produced by a dense aggregation of cottony pellets, which had a kind of oscillating motion. On removing some, I discovered minute insects, similar to the well known plant lice (family *aphides*), etc. It would seem that this blight is not so very new after all. Westwood figures the larva of the [illegible], as also a winged specimen of the largest British species of psylla.

It is not my object, however, to enter upon a lengthy notice of a family comprised of very numerous and obnoxious species, but simply to put on record my own observations with regard to what I believe to be a native species, noting that I met with them remote from introduced plants of any kind, as there was none within 1½ miles of the locality.

I would simply add that neither from Mr. Reilly, Mr. Walsh, or Mr. Harris could I learn anything further about this species, or if it were ever before noticed; nor would I have again thought of it but for the article in the *Science Record*, in which no description is given.

I hope to draw out more information on this subject, interesting to entomologists generally as well as those who cultivate the beech. JACOB STAUFFER.

Lancaster, Pa.

Completion of the Saco Iron Bridge over the Saco River, Me.

To the Editor of the Scientific American:

Yesterday we received a telegram that the last span of the iron bridge over the Saco river, at Biddeford, Me., had been swung. As this has been a rapid piece of work, and well illustrates the advantages of the American system of building iron bridges—that of interchangeable parts and pin connections, as contrasted with the system of connection by rivets—we give you a brief description.

On January 26, the wooden bridge, 460 feet long, was burned down. On the 29th, the Eastern Railway contracted with the Phœnixville Bridge Company for 3 spans of 150 feet each and 1 span of 100 feet each, to supply its place. At that time the iron lay in puddle bar. The drawings were made, the iron rolled, finished into shape, and shipped by steamer and rail to Saco, and the spans erected, ready for use, in forty days. The cost of the bridge is a little under forty thousand dollars. CLARKE, REEVES & CO.

Phœnixville Bridge Works, Philadelphia, Pa.

Accidents by Car Coupling and Switching.

To the Editor of the Scientific American:

Your assertion, in a late number, that 460 men were killed on the Pennsylvania Central Railroad alone, in 11 months of 1873, is no doubt true. In our village alone, a man a month is slaughtered, besides numerous losses of hands and feet. The men who pursue this terrible calling are all in the prime of life and fullness of manhood. They go forth each day, knowing what their ultimate fate is to be, a terrible death, mangled almost out of semblance to humanity. Yet each one that is thus killed has a dozen ready to step into his bloody shoes. Can nothing be done to arrest this slaughter? Have the hundreds of self-couplers ever had a chance for trial on any railroad? Not that I ever heard of. Yet surely some of them must have merits.

It is generally asserted that most of these men are killed by catching their feet in the frog. This is, no doubt true. The feet are caught in each end of the "guard rail," on each side of the frog, where the rail curves out, so the car wheels will not strike it. If a wooden block were placed in each end of this guard rail, large enough to keep the feet from being caught, yet so that the wheels would pass between it and the rail, these slaughters would be comparatively unknown.

Burlington, Iowa. EXPERT.

THE American sleeping and hotel cars are now coming into use in England. A late number of *Engineering* speaks very flatteringly of a recent trial of Pullman cars on the Midland Railway.

[For the Scientific American.]

Why Do Grindstones Burst?

In olden times, grindstones were always made with a square hole in the center, about six inches across, in which a square iron shaft was placed and the stone adjusted by means of wooden wedges, driven around the shaft with sufficient force to hold the stone securely in its place, and to resist the power applied to the shaft when dressing the stone off. This weakness at the edge, being equal to a lever purchase of half the diameter of the stone, has a tendency to burst the stone by the pressure of the shaft in the eye of the stone, which is also frequently augmented by the swelling of the wood employed as wedges.

Bursting of grindstones was a common occurrence under these circumstances, happening sometimes soon after the stone was hung, but frequently after being weakened by wearing away a part of it. Grindstones are generally hung at mill works by means of two heavy cast iron plates with square holes and a heavy square boss cast on the outside. Four holes are bored through the stone near the corners of the eye, corresponding with the four similar holes in the plates, through which four bolts pass and fasten the plates securely to the sides of the stone by means of nuts. A square shaft passes through the center of the plates, and the stone is adjusted by means of eight set screws passing through the boss, and resting against the sides of the square shaft. This relieves the eye of the stone from any strain, but the tendency of the four holes in lines with the corners of the eye is to weaken the stone in those directions. A case occurred of grindstones having been burst by using cast iron plates with a square boss 4 inches long, cast on the inside of the plates and tapering towards the end, which was fitted snug into the eye of the stone; and the plates being pressed against the sides, the tapering boss acted as a wedge, and two stones were burst in this way before the cause was discovered. The best mode of hanging a grindstone is on a round shaft of wrought iron on which a collar is forged, with two cast iron plates of about one third the diameter of the stone in size and dished so as to bear on the outside edge only. A screw is cut on the shaft and fitted with a heavy nut, by means of which the two plates are pressed against the sides of the stone, holding it firmly by pressure and friction alone and relieving the eye from all strain. A stone hung in this manner should not burst except by centrifugal force, caused by the stone being run at a very high rate of speed; but stones do burst even when hung so, and when not running at a dangerous rate of speed. As the bursting of a grindstone is always fraught with great danger to the workmen using it, and in its vicinity, it becomes of considerable interest to know the cause. Grindstones vary very much in the composition and in the manner in which their particles are held together. Some stones are composed of grains of pure sand, which have been pressed together with little or no cementing material, leaving numerous interstices among their particles. In others the particles of sand are cemented together with clay, rendering the stone much more compact and strong. A stone of the first kind, being porous, will weigh less to the cubic foot than the latter and will absorb more water when in use, thereby rendering it still less strong. The quantity of water absorbed by a stone of this character has been proved by actual experiment to be equal to 13 lbs. to the cubic foot, while in the closer and more compact stones it is but 1½ lbs.; so that if a dry porous stone of 6 feet diameter by 12 inches thick contains 27 cubic feet, it will absorb 364 lbs. of water when in use; and when such a stone is allowed to stand over night a considerable portion of the water will settle in the lower half of the stone, while the upper, being exposed to a free circulation of air, will lose its water by evaporation and be left comparatively dry; so that, no matter how true the stone may be dressed, the effect when in motion will be the same as of a badly balanced fly wheel; and with a little increase over the usual speed, the tendency will be, of the wet side, to fly off from the rest of the stone, or in other words to burst the stone. A case of this kind recently occurred in New Jersey. A workman had been using a stone of this character for grinding rail irons. The stone being completely saturated with water over night, the following morning he started the stone (which was about 6 feet diameter by 1 foot thick); and after working a short time, had occasion to step aside for a few moments, when the stone burst, a quarter of it passing through the roof and lodging in the side of an adjoining building. Another struck a heavy driving shaft in front of the stone, and a third fell in the pit in which the stone was running. The usual speed of this stone was about 180 turns a minute, which it is supposed was somewhat increased by the absence of the grinder. The increase of the speed of an unequally balanced stone of a porous character caused it to burst. Great care should be exercised in examining a stone for defects before hanging it. This can best be done by washing off the sides and edge with water and a broom; and if any crack be discovered, the stone should be rejected. No part of a grindstone should be allowed to stand in water when not in use, as this would but increase the tendency to burst in the manner above referred to, besides causing a soft place. J. E. M.

SLUGS AND SNAILS.—A correspondent of the London *Field* suggests an easy and, he says, most effectual way of getting rid of these garden pests, namely: Put small heaps of bran (about two handfuls) close to the plants which they destroy most, and then, about 10 or 11 o'clock at night, go round and put a handful of quicklime on each heap; the number of slugs found killed in the morning will be almost incredible. Slugs prefer bran to any fruit or vegetable, and will congregate on these heaps from all parts of the garden.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NEW SACCHAROMETER AND A [illegible] PLATE.

The new instrument invented by M. Laurent, of Paris, is composed of an ordinary bi-refracting prism for a polarizer and a Nicol for an analyzer. The latter is fixed, with a small Galilean telescope, on an alidade with which it turns. The novel portion consists in a thin plate of sheet gypsum, covering the half of a diaphragm, situated between the polarizer and analyzer. Placed between two Nicols, of which the principal sections are perpendicular, this plate gives yellow of the second order, corresponding to the D sodium line, either with white or with yellow light. If the Nicols have their sections parallel, with white light, the complementary color, a blue violet, is obtained; with yellow light, black. The plate of gypsum produces therefore in very simple manner the effect of a polarizer in two portions, of which the principal sections make to each other a certain angle; and moreover it permits, without complication, the rendering of this angle variable between 0° and 45°, a point of considerable advantage in practice; for as a liquid more or less dissolved being given, the angle which will give the maximum of precision may be chosen.

In order to render the sodium flame quite monochromatic, it suffices to interpose between the flame and the polarizer a plate of bichromate of potash, a substance which has the property of absorbing the violet, blue, and a part of the green rays present in the sodium light, which diminish precision when it is desired to establish the equality of shades in giving different colors to the two portions of the diaphragm.

COMPARATIVE VALUE OF ARTIFICIAL ALIZARINE AND MADDER.

The Industrial Society of Mulhouse, France, have recently published a report on the effect of the introduction of artificial alizarine upon the consumption of madder. The employment of the former product is constantly augmenting, and it is manufactured on a large scale in Alsace, Germany, and Russia. It is believed, however, that the large demand will not affect the normal consumption of madder; or in other words, the proportion of pure madder used in the arts before the introduction into commerce of extracts of madder, will remain unchanged. It is with these extracts that artificial alizarine comes in competition, but only to a certain extent; for while it produces violet shades of greater brilliancy and beauty, its red are inferior. In order to completely replace madder, another principle of that material must be present in the artificial product, namely purpurine, which furnishes fine orange reds, but of which at the present time even the chemical constitution is not definitely known. Hence it is considered that the best tints can be obtained by artificial alizarine and madder extract combined, employing the latter at the shade of red most closely approximating orange.

THE WILD PLANTAIN AS PAPER STOCK.

The Belgian Consul General in British India reports that the fiber of the wild plantain, found in great quantities in the Andaman Islands, has been successfully used in paper making. The directors of the Bally paper mills, in the above mentioned country, state that the material is worth $40 a ton, and that they are purchasing it in quantities at that price.

DETECTION OF ACETIC ACID IN WINES.

M. Kissel [illegible], in separating acetic acid from wines by distillation, the acid may escape undetected, because it forms acetic ether with the alcohol. This inconvenience may be avoided by saturating the wine with baryta. The alcohol is then distilled off, and phosphoric acid added to the residue. On distilling again, the acetic acid is found in the distillate, and may be determined.

FRACTURE OF A FLY WHEEL.

At the Chatham Dockyard recently, the great fly wheel of the rolling mills steam engine, weighing nearly thirty-five tons, broke to pieces while revolving at great speed, and the fragments were violently hurled in all directions. No one was hurt. The second motion cog wheel, weighing several tons, was broken by pieces of the other wheel falling upon it, and most of the machinery was more or less damaged by the iron fragments. The cause of the disaster is not yet known, but it is supposed to have been a tooth of the great cog wheel breaking off and falling among the machinery. The extent of the damage cannot be known till all the machinery has been examined, but it will probably amount to several thousands of pounds. The accident will cause work to be stopped for four or five months. The loud report made by the wheel breaking was heard at some distance, and numbers of men rushed to the scene, fearing that a boiler had exploded.

A REMEDY FOR HYDROPHOBIA.

Professor Maisch recently presented to the Philadelphia College of Pharmacy a sample of *tecomapatilla*, a new remedy for hydrophobia, from Mexico, where it is said to have been successfully used in the case of the terrible malady mentioned. It is administered in the form of a decoction. [illegible]

LIFE OF ATLANTIC CABLES.

The Anglo-American Telegraph Company have contracted for an additional cable, to be laid by the steamship Great Eastern during the coming summer. The expense to the Company will be about $[illegible]. The company now has four cables on the bottom, one of which, the cable of 1866, failed last year. From the fact that the company, instead of repairing that cable, is now about to lay a new one, *[illegible]* conclude that repair is useless, and that the life of an ocean cable, of the kind used by the Company, is only seven years.

Adulterations of Coffee, Tea, and Pepper.

At a recent meeting of the Chemical Society, London, Mr. J. Bell gave some interesting particulars about the adulterations of these articles.

The adulteration of coffee can only be successfully accomplished after it is roasted and ground, but has, perhaps, been carried to as great an extent as in almost any other article of food. A very simple way of detecting the presence of chicory in coffee is to sprinkle a little of it on the surface of water in a test tube or wine glass, when each particle of chicory becomes surrounded with an amber colored cloud, which spreads in streaks through the water until the whole acquires a brownish tinge; with pure coffee, however, no cloud is produced until the lapse of about a quarter of an hour. Another method of detecting adulteration is by the depth of color obtained by the infusion of a given weight of the suspected article in water, and by the density of the infusion. The use of the microscope, however, is indispensable. The ash of coffee, remarkable for the minute quantity of silica it contains, and for the absence of soda, affords a valuable indication of its purity.

ADULTERATIONS OF TEA.

Tea is adulterated to a very large extent, not only with leaves of various kinds, including exhausted tea leaves, but also with inorganic substances, such as quartz, sand, and magnetic oxide of iron; these latter substances are rolled up inside the leaf, and one sample of green tea examined was found to contain no less than 20 per cent of quartz and 9·6 of the magnetic oxide. The latter may readily be separated by grinding up the tea and removing the magnetic oxide with a magnet. The facing employed for green tea usually consists of French chalk and Prussian blue. In the preparation of exhausted tea leaves, they are rolled up with gum water and then dried, catechu being added in some cases to restore the astringency. The article known as the "maloo mixture" consists essentially of exhausted tea leaves. In searching for the presence of leaves other than those of the tea plant, the best method is to heat a small quantity of the suspected tea with water until the leaves are sufficiently softened to admit of being unfolded. They should then be spread out on a piece of glass and carefully examined as to the nature of the serrations and the character of the venation, also the appearance of the epidermis and the stomata, and the peculiarities of the hairs as shown by the microscope.

ADULTERATIONS OF PEPPER.

The two kinds of pepper, known in commerce as black and white pepper, are derived from the same plant, but differ in the latter being bleached, or having the husk removed by washing; but neither kind can be adulterated with success before it is ground. The most common adulterants for ground pepper are linseed meal, the husks of mustard seeds, rice, bean and pea meal, and the flour and bran of the ordinary cereals, ground chillies being added to restore the pungency. Some of these substances can be readily detected by diffusing the pepper in water, and pouring the mixture on to a muslin sieve. The husk and particles of the chilli can then be recognized, and also the sawdust-like fragments of rice. The mustard husks are known by their cup-like shape, while the smooth, shiny appearance of the linseed readily distinguishes it from the dull brown of the pepper.

RECENT SCIENTIFIC PROGRESS IN EUROPE.

Sir G. B. Airy, Astronomer Royal and President of the English Royal Society, in the course of his address announcing the distribution of medals of that learned body to various eminent scientists, took occasion briefly to review recent events in the progress of Science, especially in Europe. While the discourse omits many discoveries and indeed lightly passes over all, as a necessary consequence of its synoptical form, it nevertheless affords a sufficient résumé of the doings of the past twelve months to be both interesting and valuable as a retrospect. We need not remark that, by reference to the volumes of our journal, many of the discoveries and researches noted will be found in fuller detail. Those outlined in the following paragraph as English investigations constitute the principal communications to the Royal Society.

In astronomy, Messrs. Lockyer, Seabroke, and Huggins, have made extensive observations of the chromosphere and solar protuberances. Lord Rosse has produced a very complete treatise on the radiant heat of the moon, with all the modifications dependent on the lunar phases, and on the absorption produced by our atmosphere at different lunar altitudes. In cosmic science, Wells has found the unlooked for fact that the sea on the coast of Spitzbergen is warmer than on the opposite coast of Greenland.

Commander Wharton has verified the existence of a current running from the superficial waters of the Black Sea, through the Bosphorus and Dardanelles, that is met by a deeper current setting in the opposite direction. In biology, Messrs. Bastian, Ray, and Lankester have made important observations on life in organic infusions. In paleontology, Professor Williamson has examined the structure of fossil plants in coal, and Professor Owen has extended his investigations of fossil Australian marsupials. In botany, the most complex arrangements of leaves about a mother stem have been reduced to the primary formation of leaves ranged in two opposing directions by simple mechanical considerations. In chemistry, various analyses and experiments have been produced, but no new general principle established. In optics, Stokes and Lee have described the effects of pressure on gases, by the alteration of the character of the spectra. In magnetism, some interesting facts have been adduced, relating to the magnetic influence in large iron tubes, such as tubular bridges. In mechanics, Sir W. Fairbairn has contributed valuable information on the durability of iron ships and strength of riveted joints, and Captain Galton has devised a mechanical apparatus which shows to vessels the best course to pursue.

The progress made elsewhere in Europe, President Airy sums up as follows: In astronomy, Leverrier has completed his theories of Jupiter and Saturn. Vogel and [illegible] have verified Huggins' discovery, by the spectroscope, of the traces of motion in the composition of comets. Huggins has examined seven nebulæ, in order to discover whether their apparent movement is toward or away from our system. The research was facilitated by a coincidence of a spectral line of the nebulæ and a line in the spectrum of lead. The results indicated no appreciable motion. Father Secchi has remarked the sudden appearance of a brilliant point in the sun, which gave the spectrum lines reversed, indicating an ignition with a distortion of the lines, showing that the igneous mass was approaching us, in other words, that an explosion had taken place. Preparations by the various governments have been made for observing the coming transit of Venus, and by some German astronomers for observations of Flora, for measuring the solar parallax.

In geodesy, MM. Cornu and Baille have computed by experiment the mean density of the earth to be 5·56. In France, preparations are being made to repeat the observations of the great circle of the meridian.

In geography, the Challenger expedition may be noted as yielding many important additions to our knowledge. Young's Congo expedition has explored the African continent in the neighborhood of the Congo river. A Swedish arctic expedition, blocked in the ice all winter, at the northern extremity of Spitzbergen, has been rescued. We have recently published an extended paper on geographical progress in 1873, to which the reader is referred for a fuller record of progress.

In anatomy, the most remarkable labor is the experimental discussion of the action of various portions of the brain, by Professor Ferrier.

In natural history, the works of Buller on New Zealand and of Vincent Walsh on the Cetacea, have added greatly to our knowledge. The new aquarium at Brighton, England, has also been the means of valuable observations of habits of marine animals.

In paleontology, Professor Van Beneden, of the St. Petersburgh Academy, gives the results of a long series of observations on the cetaceous fossils of Europe, a work which may form a supplement to Cuvier's great treatise. Dr. Burmeister, aided by the public museum of Buenos Ayres, has almost entirely reconstructed the extinct species originally indicated by the names of toxodon, glyptodon, and macrauchenia. Professor Owen has continued his reconstruction of extinct birds of New Zealand, and has discovered traces of a large bird without wings.

In medicine, improved methods have been adduced for the study of contagious diseases, and for the investigation of "nervous storms." The spectroscope has been largely introduced into medical jurisprudence, and in surgery much valuable progress has been made.

In botany, Drs. Hooker and Bentham have continued the preparation of their catalogue of all known flowering plants, and the latter author has further prosecuted his studies of Australian flora. Considerable discussion has appeared as to the question of whether lichens are or are not parasites of a more simple form of algæ. Much attention has been given to the bacteridiæ, and their supposed influence on the production of putrefaction. The mode of reproduction of fishes has been the subject of much examination and speculation. The curious fact has been discovered that the movement of the leaf of the dionæa muscipula produces electric phenomena analogous to those which accompany the motion of a muscle.

In chemistry, President Airy says that no fundamental theory has been announced, except in the doubt expressed, whether the existence of four isomeric lactic acids, in appearance demonstrated by Wislicenus, agrees with the actual theory of organic chemistry.

In optics, a new determination of the rapidity of light, by M. Cornu, shows the velocity in a vacuum to be 186,700 miles per second, mean solar time. Quincke in his experiments on diffraction has demonstrated that there is often an unexpected accompaniment of polarization.

TO NEW SUBSCRIBERS.

The present number (13) completes the first quarter of the year. It has been our custom to commence all subscriptions at the beginning of the year and to send the back numbers from the first of January. Hereafter the paper will be sent from the date of receipt of subscription; but to those who wish them, the back numbers from the commencement of the volume will be furnished, and the subscription dated from the first of the year.

EXHIBITING PHOTOGRAPHS.—The effect of photographic transparencies in the microscope, as well as on the screen, is greatly improved by placing a pale blue glass in the path of the illuminating beam. This corrects the brown or "foxy" tone which they too often present, and gives depth and richness to the shadows.

GOLD may be hammered into sheets so thin that 282,000 of them, placed one above the other, will only occupy the height of one inch.

IMPROVED DIAGONAL PLANER.

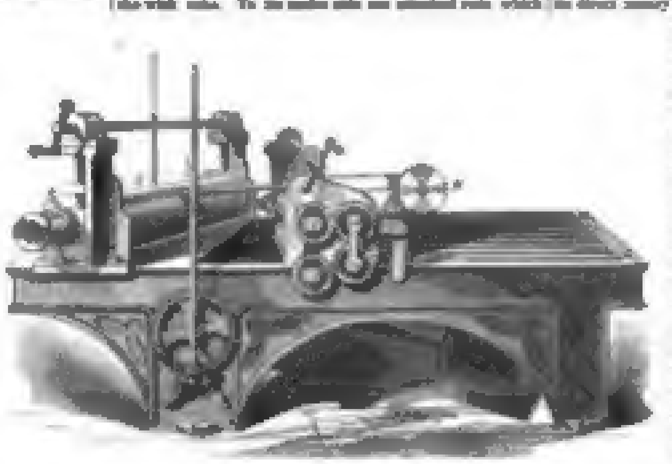
To mechanics familiar with the ordinary form of wood planing machinery, the only feature in the device herewith illustrated to which attention need be directed is the position of the cutter head, which, instead of being at right angles to the longitudinal axis of the apparatus, is placed at an inclination of about 45° to the same.

The inventor claims that, by this arrangement, surfaces presented by knotty cross-grained lumber, and by made up articles such as doors and blinds, are planed much more expeditiously and thoroughly, and with a saving of half the power required to turn the machines having cylinders at right angles.

Our engraving is prepared from a photograph of the apparatus in use in a factory at Whitehall, N. Y., which, we learn, is constantly in operation, smoothing doors and blinds at the rate of 500 per day. The articles are made up either of unsurfaced or surfaced lumber, and, after being glued together, are run through the machine in the same way and as easily as ordinary timber. It is stated that a boy, able to handle the doors, can pass fifty per hour twice under the cutters. The surface left upon the wood, it is claimed, is much smoother than is produced by ordinary planers, and hence labor and time are saved in finishing.

The frame of the machine is of iron. There is one set of six inch iron feed rolls and expansion gear. The diagonal cutter head is shown at A, and the cutters, three feet eight inches in length, make 3,500 revolutions. Motion is communicated by pulleys on a countershaft either over or under the apparatus, which must be detached from the latter on account of the angle of head and feed. A [illegible] inch belt runs the cutter head, and a 2 inch belt actuates the feed, trimming, and jointing portions. The trimming saw, B, which cuts the wedges simultaneously with the smoothing operation, is shown, in the engraving, on the side of the machine close to the feed rolls. The capacity for work is stated as fifty 2 feet 6 inches by 6 feet 6 inches doors per day, and the cost of the operation is claimed to be less than one fifth that of hand labor. The inventor estimates that, if the machine be kept constantly in operation, its savings will be at least $20 per day of 10 hours.

Parties wishing to manufacture these machines for the proprietors of the patent, or on royalty for general trade, will address W. R. Norris, 115 Ward street, New York city.



NORRIS' DIAGONAL PLANER.

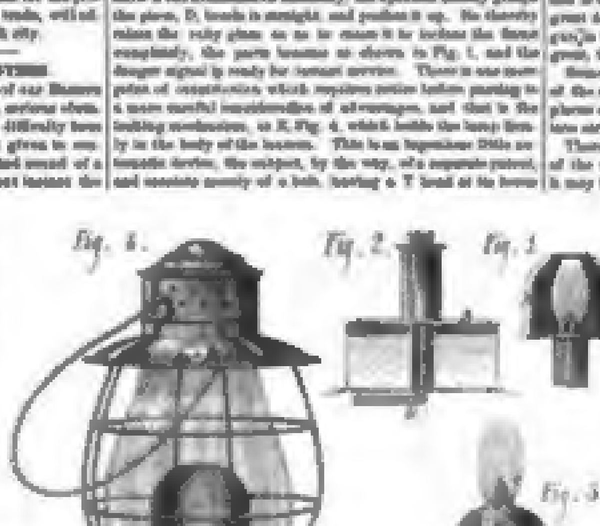
THE QUICK SIGNAL RAILROAD LANTERN.

Not many months ago, a night train on one of our Eastern railways was interrupted in its progress by a serious obstacle in its path. Hardly had the nature of the difficulty been apprehended, and fairly before time had been given to consider a means of surmounting it, the unexpected sound of a swiftly following express was heard. The next instant the head light of the locomotive appeared around a curve. The conductor and brakemen of the stopped train were forward. Each realizing the imminent peril, instinctively sprang for a red light to make the danger signal, but too late. The colored lanterns were in the baggage car, in the rear, in fact everywhere but in their hands. In the few inevitable seconds of delay, the approaching train thundered over the intervening distance and crashed into the rear cars, scattering destruction and death. Fire added its horrors to the calamity, the slaughtered were numbered by dozens, and the loss of property measured by hundreds of thousands of dollars; and this because a single ruby light was not at hand at the instant it was needed.

Instances of this description might be readily multiplied; and possible ones, the imagination requires but little exercise to suggest. A switch tender, for example, suddenly discovers a rail broken, or that his switch mechanism has become clogged and refuses to operate. Not expecting any such circumstance, he has left his danger light in his station house; a lightning express may, at that instant, be due. The man has no time to go for his lantern, perhaps some two hundred feet distant; down comes the train, and in a few moments a fearful accident has taken place. It might be supposed, in view of such facts and possibilities, that long ago railroads would have adopted some device which would render the presence of a danger signal in the hands of every employee on duty not merely obligatory, but as much a necessity as carrying of the ordinary white lantern. But there is no such invention at present in use. Separate lights are allowed to, and those on which the safety of life and property depend are still left here or there, in positions which, at one moment handy, may, at the next, be the most inconvenient and inaccessible.

We have lately had brought to our attention a new form of railway lantern which meets all the requirements indicated in the above lines. It is an invention which absolutely insures the carrying of a red light by every individual to whose hands is the common lantern. In other words, it is an arrangement whereby, in a fraction of a second, a white may be changed to a ruby light, and vice versâ, and this by mechanism so simple that failure is practically impossible. The details of construction will be readily understood from the annexed engraving.

A, in Fig. 1, is an inverted cup of ruby glass surrounding the flame of the ordinary lamp and, of course, having an opening above for the escape of smoke, etc. This cup rests upon a small circular metal platform, B, Fig. 2, and is held in place by a wire spring, C, Fig. 3, catching on its rim. The platform, B, is movable, and has an aperture in its center for the wick tube. To its under side are attached rods which pass down in short tubes extending through the body of the lamp, as shown in section in Figs. 2 and 3. To the extremity of the rods is hinged a prolongation or handle, D, the ends of which are connected. The reader has doubtless already divined the operation of this simple contrivance. Ordinarily, when the piece, D, is folded over against the bottom of the lamp, the upper extremity of the wick tube extends a little above the ruby glass envelope, as represented in Fig. 3. The lantern is then a simple white light. If now it be desired to show a red illumination suddenly, the operator merely grasps the piece, D, bends it straight, and pushes it up. He thereby raises the ruby glass so as to cause it to inclose the flame completely, the parts become as shown in Fig. 1, and the danger signal is ready for instant service. There is one more point of construction which requires notice before passing to a more careful consideration of advantages, and that is the locking mechanism, as E, Fig. 4, which holds the lamp firmly in the body of the lantern. This is an ingenious little automatic device, the subject, by the way, of a separate patent, and consists merely of a bolt, having a T head at its lower extremity. The projections on the lamp is slipped into a right angled slot on the cylinder, first up, then to the right. As it is pushed upward it raises the bolt, then, on being turned, slides along the lower side, until the extremity of the horizontal part of the slot is reached. The bolt by this time is cleared, and, being no longer supported by the lug, falls back by its own weight, and locks the lamp in place. The advantage of this is that the lamp can be inserted in an instant by feeling alone, and once caught, it is rigidly secured.



THE QUICK SIGNAL RAILROAD LANTERN.

It is perfectly well understood by the inventor that, in order to insure the adoption of some, of any apparatus which has been long and exclusively employed, to the merits of a new device, designed as a substitute, the novelty must be shown to have, not only great advantages, but advantages which will be productive of increased economy, in a word, that "have money in them." Hence the following brief calculation: A road, let it be supposed, uses 4,000 lanterns, of which 1,000 ruby ones is a fair proportion. It is proposed to substitute 3,000 lights of the form we have described, which serve already a double purpose. What is to be made by the operation? 3,000 common white lanterns cost about $3,000; 1,000 ruby lanterns cost $1,750. Oil for 1,000 ruby lanterns, at $18 per year each, $18,000. Total, $22,750. Cost of improved lantern, $2 each. Total, $6,000. Balance in favor of improvement, $16,750 per year.

Having thus, we think, sufficiently indicated the merit of this invention as a preventive of accident, and having shown its direct money value, a few minor though important advantages remain to be noted by way of conclusion. And first, the red light thus arranged gives a much greater illumination, one of three times the intensity of the common ruby lantern, the inventor tells us. This is probable, from the fact that the clear glass shade serves to diffuse and reflect the rays while not obstructing them; whereas, in the large shade of entirely dark glass, little more than the strong direct rays from the flame reach the eye, the others being absorbed in traversing the colored medium. At a certain distance, for instance, where simply a dot of red flame is seen in the ordinary lantern, this device would appear as a ball of red fire.

The fittings and construction of the lantern generally are of improved description, and are of durable and strong material. The probabilities of breaking the red glass are, of course, much less than those of injuring the large red shade of the common form of signal; while, in event of such happening, the small cup can, necessarily, be much more cheaply replaced.

The inventor informs us that the invention has been ordered for use by every railroad to the managers of which its advantages have been exhibited. In order to afford a full examination, a single lantern will be sent by express, as a sample, to every road desiring to test it in actual employment. Further particulars may be obtained by addressing Mr. E. W. Taylor, sole agent, 271 Pearl street, New York city.

Caviare.

This is an article of food prepared from sturgeon roes, and is extensively used in Russia, where it is considered a great delicacy. The preparation of this food has been begun in this country; and as our supplies of the fish are very great, the new industry promises to become important.

Some firms on Lake Erie have undertaken the utilization of the sturgeon, receiving immense numbers from various places on the lakes. They smoke the flesh, which is cut up into strips, and prepare the roe.

There are many peculiarities connected with the treatment of the sturgeon roes and their conversion into caviare, and it may be of some service to those interested in the trade to know how this is prepared in the White Sea and the Caspian, the headquarters of the business. According to Mr. Alexander Schultz, two kinds are made; one fresh or grained, and the other hard or pressed. In both cases the roes are placed upon a web or network, with narrow meshes, forming a kind of sieve stretched over a wooden hoop. Possibly a fine wire gauze would answer a still better purpose. The fish eggs are then forced through the meshes by pressing the white mass lightly, until nothing is left on the upper surface but the cellular tissue, the fat, and tendons. The eggs fall into a wooden receptacle placed beneath, and are next sprinkled with very fine salt of the best quality, the mass being stirred with a large wooden fork having eight or ten teeth. The quantity of salt necessarily varies, according to the season, from 5 to 1½; that is to say, in the month of August 3 to 5 pounds of salt are used to the pood (36 pounds) of roes, and 1½ to 2½ in the winter. The less the caviare is salted, the more it is esteemed.

At first the eggs, mixed with salt, exhibit a pasty appearance when stirred; but after each grain is thoroughly impregnated with the salt, the mass swells; and when stirred there is a slight rustling, similar to what would be the case in the stirring of fine particles of glass. This is a sign that the preparation is complete. The caviare is then placed in casks of linden wood, which imparts no unpleasant taste, as might be the case with most other materials.

To prepare the pressed caviare, a tub half filled with pickle, more or less strong with salt, according to the temperature of the season, is placed in the network. To secure a thorough impregnation of the eggs by the pickle, the mass is stirred with a wooden fork, turning it always from the same side. Then the eggs are strained out, and, when thoroughly drained, a quantity of about 100 pounds is placed in a sack and subjected to the action of a press, in order to remove all of the pickle, and convert the whole into a compact mass, as such is converted into cheese. In thus preparing the caviare a number of the eggs are broken, and a portion of the contents runs off with the pickle, so that for each pood there is a

tum of 18 to 16 pounds. After removing the pressed caviare from the box, it is placed in sacks, holding about 80 pounds, the interior of which is lined with napkin cloth, on which account in commerce this always bears the name of "napkin caviare." The better quality of the pressed caviare, that is to say, that which has been less mashed and salted, is placed in narrow, cylindrical cloth bags, and it is then called bag caviare. Caviare is also transported in boxes of tin, hermetically sealed. Fresh caviare is always preferred to the pressed, but is more expensive. Thus, at Astrachan, fresh caviare is worth from 20 to 30 roubles the pood, while the pressed is worth only 8½. It is much more profitable to prepare the grain caviare than the pressed, as it brings a better price, takes less salt, and requires less labor. There are exported every year from Astrachan about 11,000 pounds of caviare, which goes especially to Berlin, Dresden, and Vienna.

In commerce, the caviare from the roe of the Beluga sturgeon (*acipenser huso*) is more esteemed than that from the *A. stellatus*. The best of all is that of the sterlet (*A. ruthenus*); but this scarcely enters into commerce. The different kinds of sturgeon have roes differing in size, this depending upon the quality of fish, the season, and the particular place of capture. The roes of sturgeon which are taken in the sea, between the 9th of July and the 15th of August, are allowed to remain only a few hours in the pickle, and they are then removed, and placed, without being pressed, in sacks of 5 to 10 poods. If, on touching the roes, they are found to be tender, and the ovaries have already begun to decay, the roe, ovaries and all are thrown into the pickle, so that the whole may be impregnated with salt. This is the most inferior quality, and is shipped in sacks of 27 poods each, and is worth only three or four roubles per pood. This is known as summer caviare. The total amount of caviare obtained in the Caspian Sea fisheries amounts in one year to 100,000 poods (about 3,600,000 lbs.), worth 1,400,000 roubles, or $1,100,000.

THE CLEPSYDRA IN ROME.

It is not very often, in these progressive days, that we find the ancient methods of measuring time in actual employment. The sun dial, it is true, occasionally serves as an ornament to some country lawn, but little dependence is placed on its slowly creeping shadows. The hour glass has disappeared from the pulpits of the parsons; for twenty minute sermons, instead of many-headed dissertations prolonged through hours, are now sufficient for the spiritual needs of their flocks. The divided candle exists only in history, and is linked with the story of good King Alfred. But the water clock remains; not in this country, to be sure, but where it was used a thousand years ago. Julius Cæsar, tradition tells us, found by its aid that the summer nights in Britain are not of the same length as those in Italy. Cicero relates that the length of speeches made by senators was regulated by clepsydræ kept in the senate chamber, and the same parliamentary practice, which now holds in our own legislative halls, of a member yielding the floor for a certain number of minutes of his time to another speaker then existed, for a grave senator often gave so much of the water as remained in his clepsydra to a colleague, who was thus enabled to obtain a longer or an extra water time for his speech than would have been otherwise at his command. If a legislator in those days, however, was interrupted by absurd questions—something after the fashion which occasionally appears when our learned representatives indulge in discussions on paper—or was embarrassed by the accustomed habits of his associates during a long-winded speech, he did not ask permission to have the latter printed and distributed at the country's expense, but simply stopped the flow both of his water clock and his rhetoric, and calmly waited until the house became ready to listen to his further remarks. The clepsydra of antiquity, in fact, while really a very useful and ingenious invention, of course was very crude in form, and hardly of the nice construction of the apparatus represented in our engraving. The clock there shown stands in a pond in the Pincio, the latter being a very elegant public park located on the summit of the Pincian Hill, one of the famous seven eminences on which Rome is built. The grounds are a favorite resort for the people, and serve the same purpose to the city that Central or Fairmount Park does to New York or Philadelphia.

The apparatus, in its present form, is the invention of Padre Embriaco, a Dominican monk; and from the pages of *L'Illustrazione*, a new illustrated weekly, published in Rome—a significant fact, by the way, of the tolerance toward progress exercised by the new régime in united Italy—we take both our illustration and the following brief description:

The water is led by pipes to a reservoir in which a constant level is maintained, and from an orifice in which the stream escapes into a receptacle divided into two compartments. Below the latter is an arrangement in the form of an anchor, the curved portion of the latter serving as a rocker on which the divided receptacle vibrates. This oscillation takes place under the entering stream, so that when one compartment is carried down by the weight of water within, the second is raised to receive the supply. A pendulum, bearing weights, is suspended from two springs, parallel to and equidistant from the resting point of the rocker, and regulates the movement of the receiver. The springs are prolonged in the direction of tangents to the curve of the anchor arms and maintain the pendulum in motion with a constant force, so that each oscillation of the lever corresponds to one of the rocker and of the receiver. The water from the latter falls upon balanced mechanism which is so constructed as to oscillate every second minute, and to transmit motion to a suitable train of wheels, which move the hands upon one or more dials in the usual way.

The sounding apparatus consists in a cylindrical reservoir, which is suspended by chains to the axle of a wheel and is arranged to empty itself every fifteen minutes. Its weight turns the wheel and thus sounds the hours and the quarters. Water is carried to the reservoir when empty, by a simple siphon arrangement.

The case of the clock, as represented in the picture, is of cast iron, made in a handsome rustic design, in excellent keeping with the general surroundings. We should imagine our inventors could easily devise a simple form of similar apparatus, which, mounted in some appropriate casting from the iron founders who make that class of work a specialty, would form an elegant and useful ornament to either public or private pleasure grounds.

Formation of Octahedral Borax.

It is known that borax forms two hydrates—the one containing 5 equivalents of water, and crystalizing in regular octahedrons; the other containing 10 equivalents, and forming oblique rhombic prisms. The octahedral crystals are commonly considered stable only at relatively high temperatures. M. D. Gernez, however, finds that both the prismatic and the octahedral borax can be produced at low temperatures. The temperature of 56°, which has been indicated as the inferior limit for the production of prismatic borax, is in reality only a temperature near the higher limit at which the production of prismatic borax has been observed, since this salt loses a part of its water at this temperature.

Absorption of Dry Ammoniacal Gas by Cane Sugar.

On employing absolutely dry sugar, and submitting it to the action of the current of ammoniacal gas, dried over a long column of quick lime, the sugar becomes at first spongy, and takes the waxy consistence described by Raspail, but in the course of twelve hours it liquefies, and flows on the surface of the tube in which it is contained: 100 parts of sugar absorb 7·33 of ammonia. On exposure to the air, the sugar loses the ammonia which it had absorbed. At the end of three months, the sugar retains only about 0·37 per cent, and has still a very pungent flavor. Glucose similarly treated liquefies very rapidly, becoming colored, and forming a crystalline product.—*M. E. Lebeuf.*

CLEPSYDRA OR WATER CLOCK, ON THE PINCIAN HILL, ROME.

Seasonable Hints on Gardening.

Winter has no sooner passed than every one possessing a patch of land considers how he will cultivate it in the coming season. In the country, the farmer is already at work with his subsoil plough, and he has decided which acres shall be sown with grain and which with vegetables. Parties owning country seats adjacent to the towns and villages along the Hudson River, in Connecticut and Jersey, says the *Commercial Advertiser*, are just now making trips to their rural homes, to give directions concerning the vegetable gardens and flower beds. Fancy gardening has of late years become so fascinating to men of means that much money is annually invested in vegetables which cost, after they are ripe, their weight in gold. One of our representative citizens estimated the value of his cabbages raised at his country seat to be twelve dollars apiece. However, the pleasure of "seeing them grow," of exhausting the skill of expert horticulturists upon them, of feeding the soil around them with the finest guano, and then of believing that, when grown, they are a little larger and better flavored than any raised by neighbors, is the height of satisfaction.

It is becoming a favorite employment with ladies to superintend their flower and vegetable gardening to devote a certain portion of the spring days to selecting and purchasing the choicest seeds, and to oversee their starting in hot beds. The early radishes and lettuce found on so many tables before their regular season are often the product of the labor and care of the female members of the family. Since window gardening has been so successfully introduced by our leading florists, and ladies have given their attention to planting and nursing flowers, the study of horticulture has been pursued by many of them until they understand the science of propagating plants.

WINDOW GARDENING.

This is an especial appropriate season of the year to make the windows beautiful with plants. There is great pleasure in bringing spring indoors by collecting the flowers which are now in bloom in the hot house, and planting them in the handsome boxes or baskets made for that purpose. Window gardening is delightful in winter time; nevertheless, there the hardiest plants suffer more or less for fresh air. At this time there are hours at noon when the windows can be thrown open, and the plants which have been housed in greenhouses will apparently speak their thanks for the drink of fresh air and the contact with the sun's rays. The plants now in blossom are the hyacinth, narcissus, tulip, daffodil, cinerarias, heath, violets, lilies of the valley, and several other varieties which are charming as companions in the sitting room. Shallow cigar boxes are very useful for planting seeds, and can be arranged to look nicely in the windows. In two or three weeks from this time it will be proper to plant mignonette and sweet alyssum, those fragrant and most suitable plants for window boxes. The vine seeds should then be put in the hanging baskets. They are for the most hardy vines. The morning glory is easily cultivated and is exceedingly graceful in leaf and flower. It will grow readily in any sunny window. Violets, early flowering snowdrops, crocuses, forget-me-nots, and primroses are the best plants for culture in outside window boxes. The complete loveliness of the rose will not permit it to be omitted from the window garden, notwithstanding it is with difficulty kept in a thriving condition. Tea and China roses are the best adapted for culture in boxes.

For keeping plants healthy which are indoors at this season, close the windows of their room by three o'clock. Great attention must be paid to their cleanliness to promote their rapid growth. Flower pots need washing on the outside weekly. Never leave water standing in the saucers of the flower pots. Water must be given to the plants plentifully in these spring months. Rain water is always best for vegetation. Stimulate plants once a week with liquid manure. A large sponge is good for a watering pot for house plants. This is the month to prepare the ground for a successful crop of vegetables and flowers.

The Warm Springs of Costa Rica.

A. v. Frantzius states that these springs, more than 30 in number, may be regarded as a continuation of the remarkable series of warm mineral springs discovered by Humboldt in Venezuela, and extending for 150 miles from Cape Paria to Morata. The Costa Rica springs begin indeed 12 degrees of longitude further west, but are situated under nearly the same parallel of longitude, namely, 10° N., in a strip of land running for 30 miles from east to west. Most of them occur in narrow mountain gorges on the banks of rivers, or are even overflowed by the rivers, so that they are visible only in the dry season. Their temperature is higher in proportion as they are situated at a lower level. The highest observed temperature is 137·1°. The water contains some salt.

Mr. H. P., a correspondent, adds his testimony to that of Mr. J. A. Field, as to the value of using glue as a healing agent for cuts, bruises, etc. "I have used glue for this purpose for the last 26 years, mostly in the cabinet shop, and never employ anything else. I have received many severe cuts and bruises, and never lost any time, to speak of. Often a piece of thin cloth is sufficient after gluing over the wound. I use the best imported glue. I never took cold in a wound yet, and it is the most speedy healing agent I ever employed. Last autumn an acquaintance of mine came in the shop with his head all bundled up. He had received a severe bruise on the back of his head, and took cold in it; and it was badly inflamed. I spread a glue plaster over the wound and bound a moistened cloth over to keep the glue from becoming dry. In one week his head was entirely well."

The Laughing Plant.

The London *Garden* copies, from Palgrave's work on Central and Eastern Arabia, an account of a plant whose seeds produce effects similar to those of laughing gas. It is a native of Arabia. A dwarf variety of it is found at Kassem, and another variety at Oman, which attains to a hight of from three to four feet, with woody stems, wide-spreading branches, and bright green foliage. Its flowers are produced in clusters, and are of a bright yellow color. The seed pods are soft and woolly in texture, and contain two or three black seeds, of the size and shape of a French bean. Their flavor is a little like that of opium, and their taste is sweet; the odor from them produces a sickening sensation and is slightly offensive. These seeds contain the essential property of this extraordinary plant, and, when pulverized and taken in small doses, operate upon a person in a most peculiar manner. He begins to laugh loudly, boisterously; then he sings, dances, and cuts all manner of fantastic capers. Such extravagance of gesture and manner was never produced by any other kind of dosing. The effect continues about an hour, and the patient is uproariously comical. When the excitement ceases, the exhausted exhibitor falls into a deep sleep, which continues for an hour or more; and when he awakens, he is utterly unconscious that any such demonstrations have been enacted by him. We usually say that there is nothing new under the sun; but this peculiar plant, recently discovered, as it exercises the most extraordinary influence over the human brain, demands from men of science a careful investigation.

Chemical Composition of Fuel.

Professor T. S. Hunt gives the results of the analyses by various chemists, taken chiefly from Bischof's "Chemical Geology," showing the relative proportions of the elements in wood, peat, coal, asphalt, and petroleum. He states that the "nitrogen, which, in most cases, was included with the oxygen in the analyses, has been disregarded, and the oxygen and hydrogen, for the sake of comparison, have been calculated for twenty-four equivalents of carbon."

1.	Vegetable fiber or cellulose	[illegible]
2.	Wood, mean composition	[illegible]
3.	Peat (Vaux)	[illegible]
4.	Peat (Régnault)	[illegible]
5.	Brown coal (Schrötter)	[illegible]
6.	" (Woskresensky)	[illegible]
7.	Lignite (Vaux)	[illegible]
8.	Lignite passing into mineral coals (Régnault)	[illegible]
9.	Bituminous coal (Régnault)	[illegible]
10.	" " "	[illegible]
11.	" " "	[illegible]
12.	" " "	[illegible]
13.	" " " (Kühnert and Geiger)	[illegible]
14.	Bituminous (mean comp.) (Johnston)	[illegible]
15.	Albert coal (Wetherill)	[illegible]
16.	Asphalt, Auvergne	[illegible]
17.	" Naples	[illegible]
18.	Elastic bitumen, Derbyshire (Johnston)	[illegible]
19.	Bitumen of Bitz	[illegible]
20.	Petroleum and naphtha	[illegible]

These analyses are very instructive and valuable.

Christian Sharps.

Christian Sharps, inventor of the celebrated breech-loading firearm known throughout the world as Sharps' rifle, died recently at Vernon, Conn., in the 61st year of his age. Sharps' rifle was, for a long time, the only effective breech loading gun in use, and its remarkable efficiency for military purposes soon rendered the old style of muzzle loaders obsolete. Sharps' original patent was granted in 1848, before the invention of metallic cartridges, when paper cartridges only were used, fired by percussion caps. The inventor's task was to make an effective breech loader, in which paper cartridges and caps could be employed, and this is what Christian Sharps successfully accomplished. The breech plug was made to slide vertically; its upper edge was sharpened into the form of a knife. The operation was such that the breech plug, in descending to its place, cut off the rear end of the paper cartridge, leaving the powder open to the flame of the percussion cap. Subsequent improvements on the gun were made by the inventor, which increased its value. Mr. Sharps was the inventor of many other useful devices besides firearms, from all of which others reaped pecuniary benefits, his own share being small. He was a most kind-hearted man.

Contamination of Water by Copper Pipes.

E. Reichardt points out that most waters take up more or less metal from iron and lead pipes, and that copper is not in any way a better material. Water which, when freshly laid on in 1859 through copper pipes, contained 7·2 parts of copper in a million contained 0·6 of copper per million in 1872. Even this latter water gave a perceptibly green metallic soap. Although the quantity has diminished during the thirteen years, yet at the end of that time a most objectionable amount of copper was still taken.

A ham, well packed in pulverized charcoal, after the usual smoking, will keep for years. Butter in pots, well surrounded with charcoal, will keep for twelve months. Each ounce of charcoal can absorb 1,000 times its bulk of deleterious gases.—*Hall's Journal of Health.*

Treatment of the Teeth.—Root Filling.

Many of the most experienced and able members of the profession still advocate the use of solid gold filling in roots as the best and most reliable method. Admitting the value of such a filling, I think we can, at present, entirely do without it.

One object in filling the pulp canal is to prevent the collection of fluids, and to avoid the deleterious effects resulting therefrom. If we can accomplish this more readily by cheaper processes, it is our duty to do so.

This, however, is not my main reason for objecting to gold fillings. Observation has taught me that many times periostitis, and even the loss of the tooth, ensues, when the operation has been performed in the best manner and by the most experienced dentists. I therefore resolved at the commencement of practice to attempt another method, not being aware, at that time, that this practice was being used by others.

Considering the relations of dentistry to the public, and those of the latter towards dentistry, it is not surprising that at the present time, in Germany, we have a larger proportion of dead and exposed pulps to treat than have our colleagues in America.

I shall not dwell upon the preparatory steps necessary to be taken in different cases, as these are familiar to the profession; but when the root is in a proper condition for filling, I proceed as follows:

Select a thread of flax, separate or loosen the fibers as much as possible, and then moisten it with chloride of zinc from the cement bottle; then rub oxide of zinc well into it, omitting one extremity of the flax, which is reserved for the application of a small quantity of carbolic acid. The thread is simply the medium for conveying the cement to the extremity of the canal, and is entirely imbedded in it. The end of the flax saturated with carbolic acid is, of course, the first inserted, and is carried directly to the apex. After the root or roots are filled, the cavity in the crown is temporarily closed with cotton and sandarac, and an appointment made with the patient several days subsequently. If, in the meantime, the tooth has been perfectly comfortable, and the patient in a healthy condition, I insert a gold filling in the crown cavity. If, on the other hand, the pulp had been deprived of vitality for a long period, and the tooth easily irritated during preparatory treatment, I fill the cavity with cement, and dismiss the patient for the time. By operating in this cautious manner, I am able to assert that I never had periostitis occur in the large number of teeth treated in this way.

As none of these teeth had given any trouble, I never had an opportunity to satisfy myself in regard to the condition of the root and the filling until, by an unfortunate accident, a young patient split off the labial surface of a first superior bicuspid, treated in this manner two years previously. The tooth was extracted, at her request. On splitting the root to the apex, I found, as I expected, the filling hard and perfect, and the periosteum in a healthy state.—*Dr. Heinrich Morel, Dds.—Dental Cosmos.*

A New Ink which Resists the Action of most Chemicals.—This ink is a solution of caseine in soluble glass, and must be kept in a bottle, with a well oiled cork.

DECISIONS OF THE COURTS.

United States Circuit Court—Southern District of New York.

[illegible]

[illegible]

[illegible]

IMPORTANCE OF ADVERTISING.

The value of advertising is so well understood by old established business men that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or the a manufacture to work it, upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

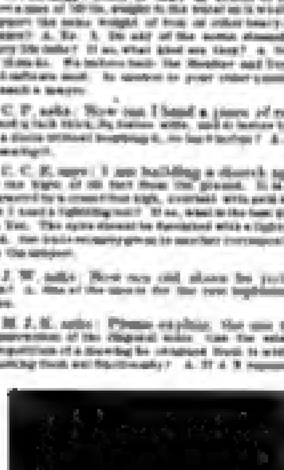
In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation, among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturers of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get so quick returns as through the advertising columns of the Scientific American.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The Scientific American has a circulation of more than 40,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

Business and Personal.

[illegible]



[illegible]

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Epicycloid. By M. M.

On Three Challenges to the Students of Nature. By D. L. S.

On Psychic Force. By J. T. C.

On Proving a Theory. By G. E. W.

On Magic Squares. By T. C. S.

On Electricity in Thermopathy. By S. T. W.

On Trades Unions. By N. W. K.

On Landing a Line from a Vessel. By W. H. D.

Also enquiries from the following:

[illegible]

[illegible]

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

February 24, 1874,

AND EACH BEARING THAT DATE.

[illegible]

EXTENSIONS GRANTED.

DISCLAIMER.

DESIGNS PATENTED.

TRADE MARKS REGISTERED.

SCHEDULE OF PATENT FEES.

APPLICATIONS FOR EXTENSIONS.

CANADIAN PATENTS.

PATENTS

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